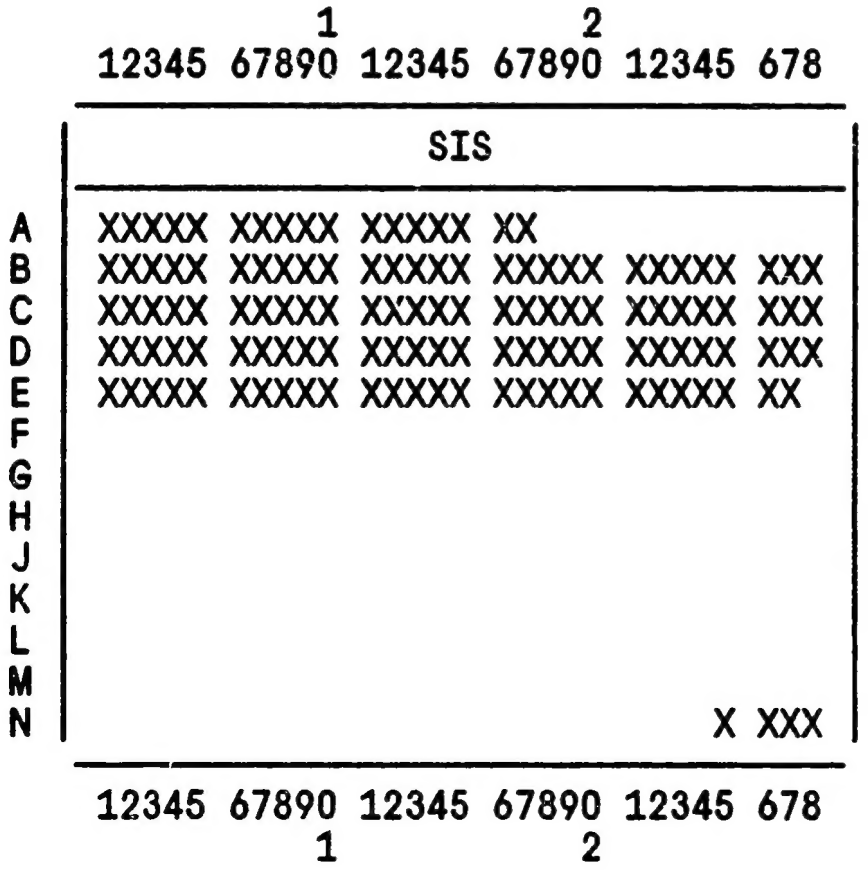
STRUCTURE OF MICROCARD

A01/1 = Structure of microcard
A03/1 = Special features, general instructions, safety measures, testers, tools and tightening torques

C01/1 = Disassembling fuel-injection pump
= Checking individual components
= Assembling fuel-injection pump

N21/1 = Index
N23/1 = Table of contents
N28/1 = Editorial note

Continue: A02/1 Fig.: A01/2




Continue: A02/1

STRUCTURE OF MICROCARD

The user prompting appears on every page, e.g.:
- Continue: B17/1
- Continue: B18/1  Fig.: B17/2

.../1 = Upper coordinate half
.../2 = Lower coordinate half

Continue: A03/1

# REPAIRING DISTRIBUTOR-TYPE FUEL-INJECTION PUMP

These repair instructions apply to VE pumps with no:

* Boost-pressure-dependent full load stop (LDA)
* Hydraulic torque control (HBA)

Special features:

* Temperature-dependent excess fuel quantity (TAS)
* Temperature-controlled idle increase (TLA)

Continue: A04/1

REPAIR INSTRUCTIONS

General
These repair instructions are subdivided into:

* Component repair for:
- Central screw plug
- Overflow restriction
- Solenoid valve
- Speed-control lever stiff
- Leaks at delivery-valve holder
- Renewing radial-lip-type oil seal
- Timing-device seal rings
- Renewing housing cover seal, control lever bearing

* Complete pump repair

Continue: A04/2

REPAIR INSTRUCTIONS
Scrap worn and damaged parts.
Always renew sealing elements.

* Component cleaning

Wash out components in commercially available cleaning agent which is not readily flammable, e.g.:
Chlorothene NU.
Then blow out with compressed air.

OBSERVE FOLLOWING SAFETY PRECAUTIONS
Order Governing Work with Combustible Liquids (Vbf) as published by Federal Ministry of Labor (BmA).

Continue: A05/1

REPAIR INSTRUCTIONS

Safety regulations governing the handling of chlorinated hydrocarbons in companies ZH 1/ 222 for employees ZH 1/ 119 as published by the Hauptverband für Gewerbliche Berufsgenossenschaften (Zentralverband für Umweltschutz und Arbeitsmedizin) Langwartweg 103, 5300 Bonn 5, Germany.
The appropriate local regulations are to be heeded in other countries.

Continue: A06/1

SAFETY MEASURES

EXCLUSIVE use is to be made of the special tools listed in these repair instructions.

INJURIES CANNOT BE RULED OUT if these tools are not used !

Continue: A06/2

SAFETY MEASURES

The procedure outlined in the Section "Removing control lever, pump with mechanical and spring-actuated power on/off damper" must be carried out with extreme caution.
Sudden spring tension relief and thus the DANGER OF INJURY cannot be precluded!

Continue: A07/1

TOOLS AND TEST EQUIPMENT

| | |
|---|---|
| Clamping flange<br>Pilot 50 mm diameter | 1 685 720 062 |
| Clamping flange<br>Pilot 68 mm diameter | 1 685 720 219 |
| Clamping frame<br>Clamping VE | KDEP 2919 |
| Prestroke measuring device<br>Replacement for ..045, prestroke adjustment | 1 688 130 180 |
| Tool kit | KDEP 1170 |
| Tool kit<br>Pressing in drive shaft bearing | KDEP 1171 |

Continue: A07/2

TOOLS AND TEST EQUIPMENT

| | |
|---|---|
| Drill bushing<br>Drilling out 1-piece drive shaft bearing on side | KDEP 1882 |
| Dial-indicator holder<br>Adjustment of dimensions "K" and "KF" | KDEP 1088 |
| Centering sleeve | KDEP 1088/0/3 |
| Measurement insert<br>Adjusting K1 dimension | KDEP 1088/0/2 |
| Measurement support, thread M 3 | 1 683 233 012 |
| Adjustment tool<br>Adjusting governor shaft with slotted nut | KDEP 1082 |

Continue: A08/1

TOOLS AND TEST EQUIPMENT

Adjustment tool KDEP 1181
Adjusting governor shaft on pump with hydraulic KSB attachment

Assembly device KDEP 1109

Pin-type socket wrench KDEP 1110
Assembly of KSB control device

Assembly tool KDEP 1097
Removing and installation of supply pump

Protective capsule KDEP 1100
Support for cam roller ring

Continue: A08/2

TOOLS AND TEST EQUIPMENT

Assembly shell KDEP 1101
Support for supply pump

Socket wrench KDEP 1087
Loosening and tightening of slotted shoulder screws with hexagon socket head

Assembly wrench KDEP 1096
Installation of setting shaft in housing cover

Assembly sleeve KDEP 2939
Protection of radial-lip-type oil seal

Continue: A09/1

TOOLS AND TEST EQUIPMENT

| | |
|---|---|
| Assembly sleeve<br>Installing O-ring on setting shaft/lever shaft | KDEP 2937 |
| Extractor hook<br>Removal of seal rings | KDEP 2938 |
| Socket wrench<br>Removal of control valve | KDEP 1086 |
| Screwdriver bit<br>Installing slotted screw | KDEP 1090 |

Continue: A09/2

TOOLS AND TEST EQUIPMENT

| | |
|---|---|
| Clamping device<br>Clamping sliding bolt | KDEP 1102 |
| Spacer<br>Adjusting MS dimension | KDEP 1084 |
| Dial-indicator holder<br>Measuring tilt clearance | KDEP 1128 |
| Dial-indicator holder<br>Measuring tilt clearance | KDEP 1146 |
| Spacer | KDEP 1130 |

Continue: A10/1

TOOLS AND TEST EQUIPMENT

| | |
|---|---|
| Adjustment tool<br>Assignment of stop lever to lever shaft | KDEP 1152/3 |
| Extractor<br>Removing radial-lip-type oil seal | KDEP 1113 |
| Extractor<br>Removing drive pinion | KDEP 1131 |
| Pressing-out and pressing-in tool<br>Bearing replacement | KDEP 1132 |

Continue: A10/2

TOOLS AND TEST EQUIPMENT

| | |
|---|---|
| Screwdriver bits for torque wrench 1/2 inch square head<br>Bolts with Torx socket head M6 and M5 | Commercially available |
| Bolts with internal serrations M6 | |
| Molykote paste | Ft 70 v 1 |
| Special oil<br>Guide pin in LDA housing | Shell Glavus G 32 |

Continue: A11/1

TIGHTENING TORQUES

Select torques in line with following add-on modules:

| | |
|---|---|
| VE with no add-on module | A13/1 |
| Cam roller ring, cold start acceleration device, coolant temperature-controlled | A17/1 |
| 2-piece control lever | A18/1 |
| Bleeder screw at cam roller ring level | A19/1 |

Continue: A11/2

TIGHTENING TORQUES

Select torques in line with following add-on modules:

| | |
|---|---|
| Coupling half and flange | A20/1 |
| Frequency valve | A22/1 |
| Hydraulic cold start acceleration device | A23/1 |
| Pneumatic idle increase (PLA) | A25/1 |

Continue: A12/1

TIGHTENING TORQUES

Select torques in line with following add-on modules:

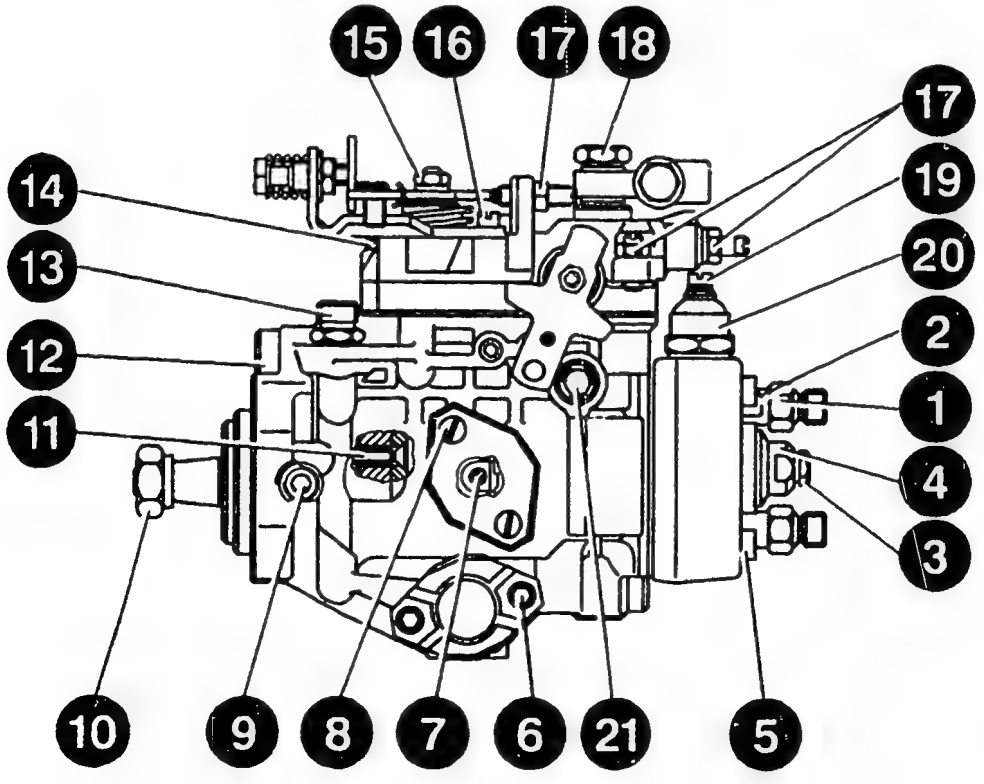
| | |
|---|---|
| Temperature-dependent idle increase (TLA) | A26/1 |
| Mounting plate | A27/1 |
| Ancillary lever, spring-actuated power on/off damper | A28/1 |
| Stop bracket for switching valve | B01/1 |
| Switching valve | B02/1 |

Continue: A13/1

TIGHTENING TORQUES FOR PUMP WITHOUT ADD-ON MODULE

| | | |
|---|---|---|
| 1 = | Delivery-valve holder | 38..42 Nm |
| | Used delivery-valve holders | |
| | Delivery-valve holder | 38..48 Nm |
| | New delivery-valve holders, new distributor head | |
| 2 = | Bleeder screw | 5.. 8 Nm |
| 3 = | Bleeder screw | 20..26 Nm |
| 4 = | Screw plug | 70..90 Nm |
| 5 = | Fillister-head/hexagon-socket-head cap screw | 7..10 Nm |
| 6 = | Fillister-head screw | 10..14 Nm |
| 7 = | Fillister-head screw-pointer | 2.. 3 Nm |
| 8 = | Fillister-head screw | 6.. 9 Nm |
| 9 = | Locking screw | 27..35 Nm |

Continue: A14/1 Fig.: A13/2




KMK02238

TIGHTENING TORQUES FOR PUMP WITHOUT ADD-ON MODULE

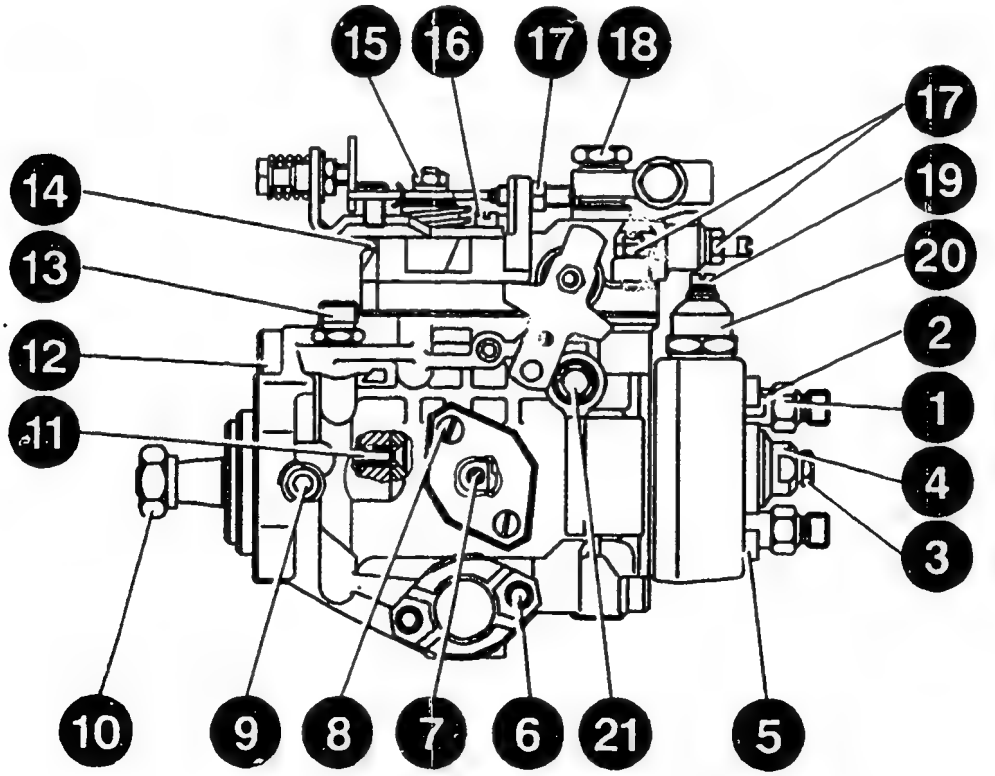
10 = Hexagon nut 60..70 Nm
Thread M12 / taper 17 mm
Part no. 2 915 011 011

Hexagon nut 90..95 Nm
Thread M14x1.5 / taper 20
Part no. 2 915 021 004
Part no. 1 463 300 316

Flat nut 70..75 Nm
Thread M14x1.5 / taper 20
Part no. 2 915 042 106

11 = Hexagon bolt, supply pump 2.. 4 Nm
12 = Slotted hexagon nut 22..30 Nm

Continue: A15/1 Fig.: A14/2

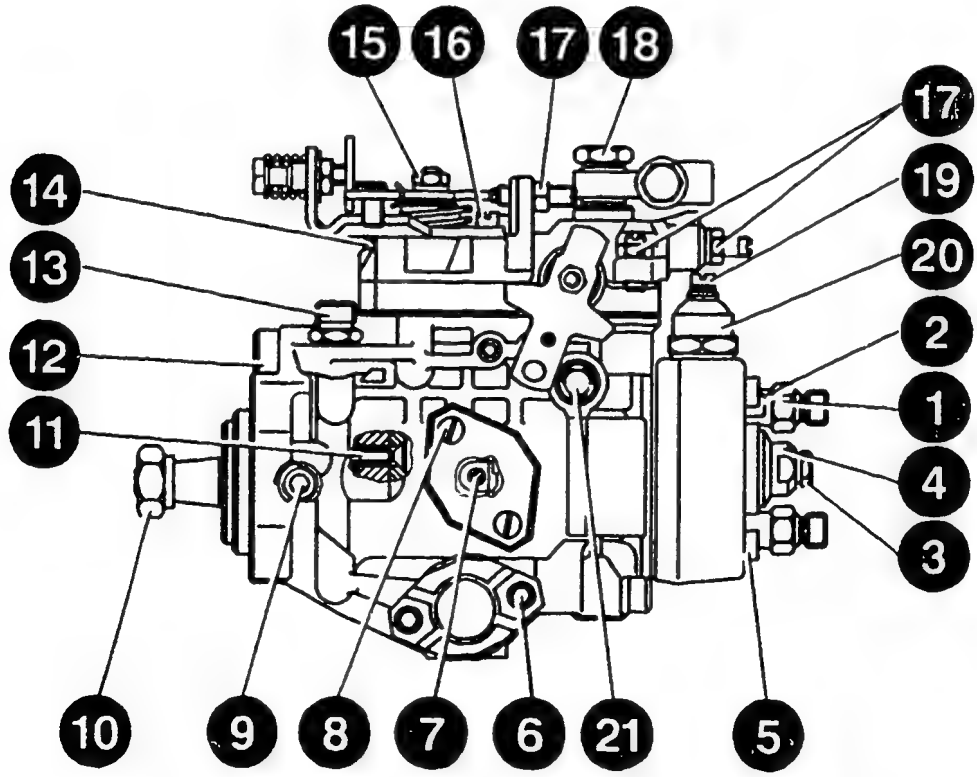



KMK02238

TIGHTENING TORQUES FOR PUMP WITHOUT ADD-ON MODULE

| | | |
|---|---|---|
| 13 = | Tube fitting / or inlet-union screw | 20..30 Nm |
| 14 = | Hexagon-socket-head cap screw / fillister-head screw | 7..10 Nm |
| 15 = | Fastening nut for all control levers | 5..10 Nm |
| 16 = | Hexagon-socket-head cap screw / fillister-head screw | 7..10 Nm |
| 17 = | Hexagon nut | 6.. 9 Nm |
| 18 = | Overflow restrictor | Nm |
| 19 = | Hexagon nut / fillister-head screw | 1.5..2.5 Nm |
| 20 = | Solenoid valve | 15..25 Nm |
| 21 = | Slotted shoulder screw | 10..15 Nm |

Continue: A16/1 Fig.: A15/2

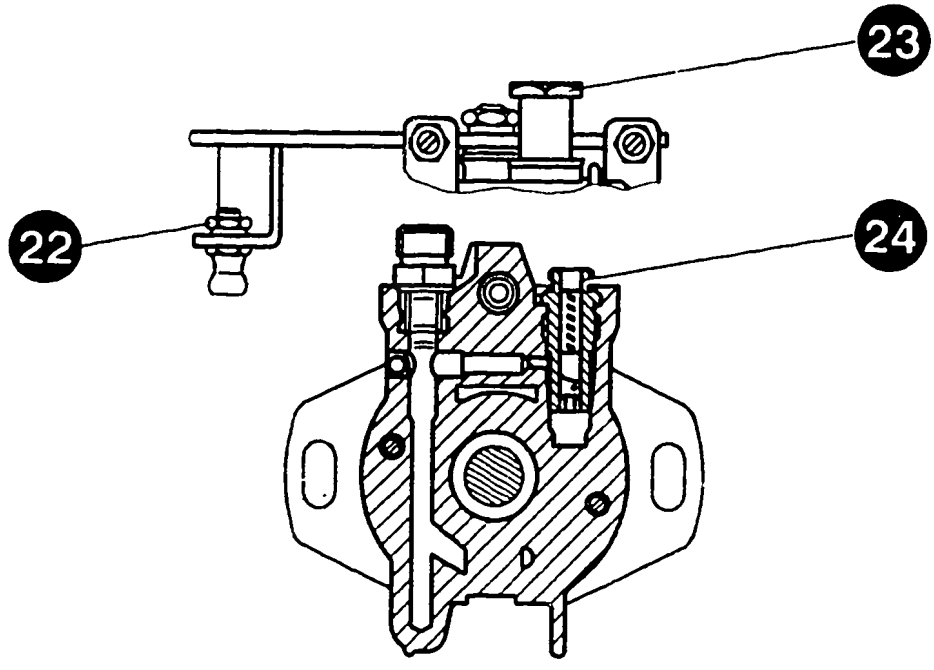



KMK02238

TIGHTENING TORQUES FOR PUMP WITHOUT ADD-ON MODULE

| | | |
|---|---|---|
| 22 = | Hexagon nut | 3.. 5 Nm |
| 23 = | Inlet-union screw with attached inlet union | 20..30 Nm |
| 24 = | Pressure regulator | 7..10 Nm |

Continue: A17/1 Fig.: A16/2

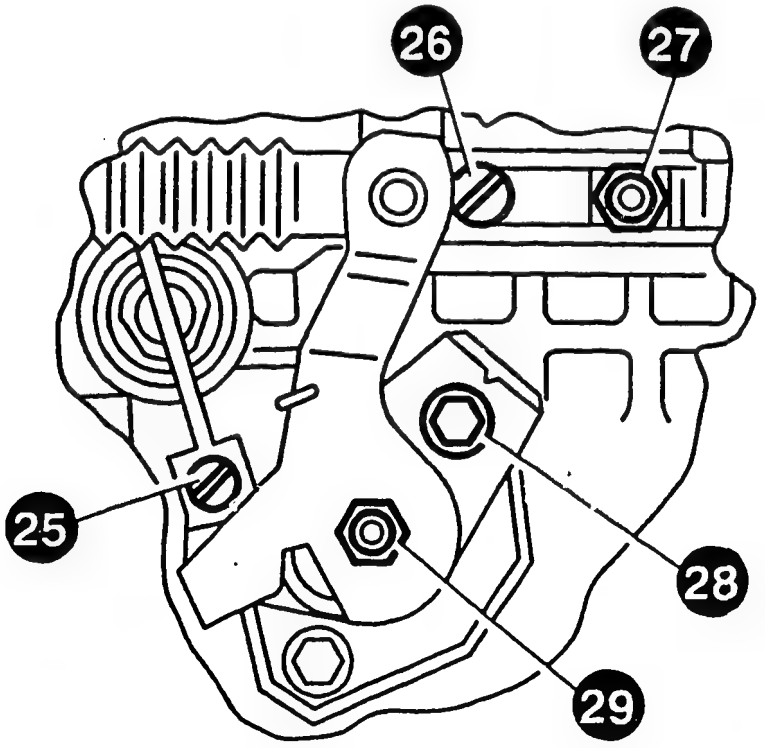



KMK02239

TIGHTENING TORQUES, PUMP WITH CAM ROLLER RING
KSB COOLANT TEMPERATURE-CONTROLLED

| | | |
|---|---|---|
| 25 = | Fillister-head screw | 3.0..4.5Nm |
| 26 = | Fillister-head screw | 0.5..1.0Nm |
| 27 = | Hexagon nut | 3.5..4.5Nm |
| 28 = | Hexagon-socket-head cap screw | 6.. 9 Nm |
| 29 = | Hexagon nut | 5..10 Nm |

Continue: A18/1 Fig.: A17/2



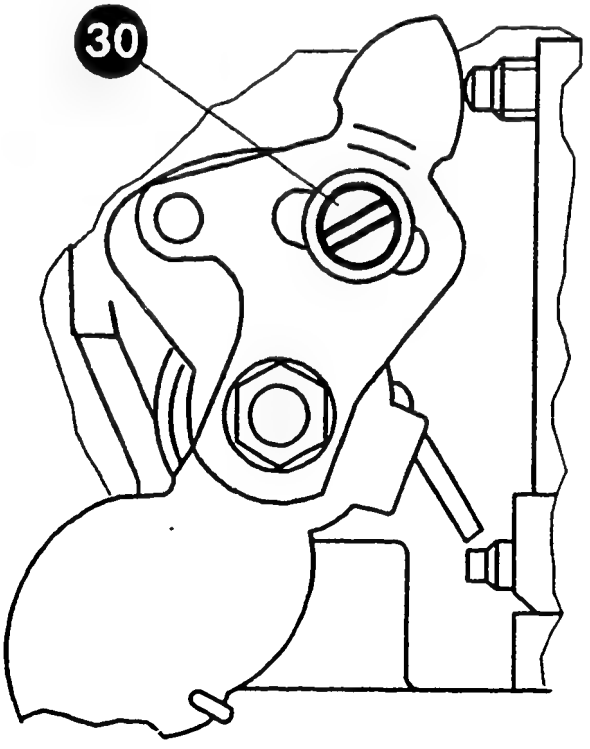

KMK03274

TIGHTENING TORQUES, PUMP WITH 2-PIECE SPEED-CONTROL LEVER

30 = Hexagon nut/fillister-head screw 6.. 9 Nm

Continue: A19/1 Fig.: A18/2

KMK03275

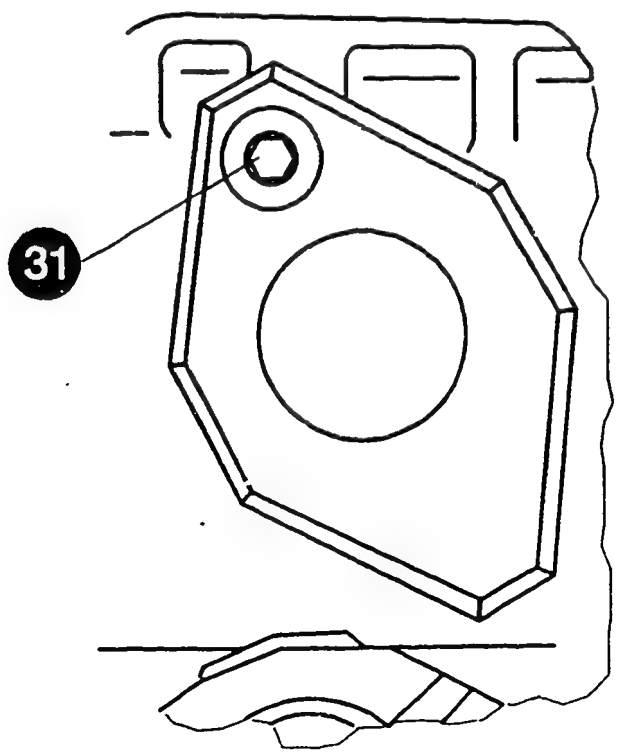


TIGHTENING TORQUES, PUMP WITH BLEEDER SCREW

31 = Bleeder screw 3.. 5 Nm

Continue: A20/1 Fig.: A19/2

KMK03277

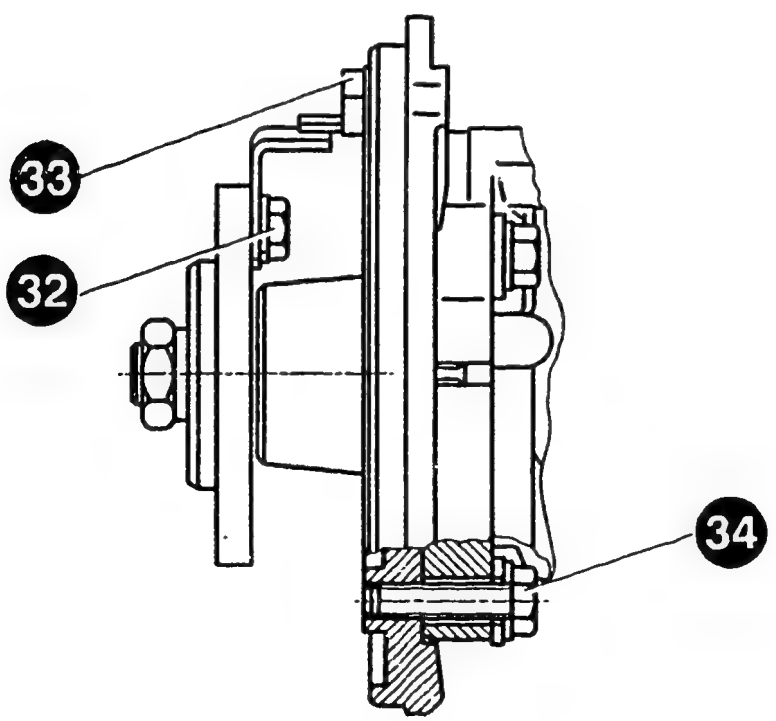


## TIGHTENING TORQUES, PUMP WITH COUPLING HALF AND FLANGE

| | |
|---|---|
| 32 = Hexagon bolt | 7..10 Nm |
| 33 = Hexagon-socket-head cap screw | 2.. 3 Nm |
| 34 = Hexagon bolt | 16..24 Nm |

Continue: A21/1 Fig.: A20/2

KMK03278

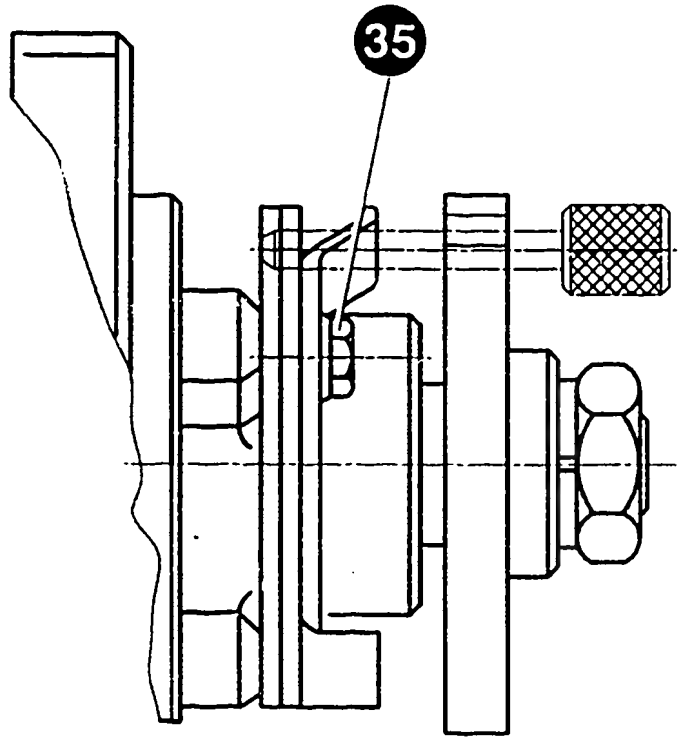


# TIGHTENING TORQUES, PUMP WITH COUPLING HALF AND FLANGE

35 = Hexagon bolt 4.0...6.0 Nm

Continue: A22/1 Fig.: A21/2

KMK03279

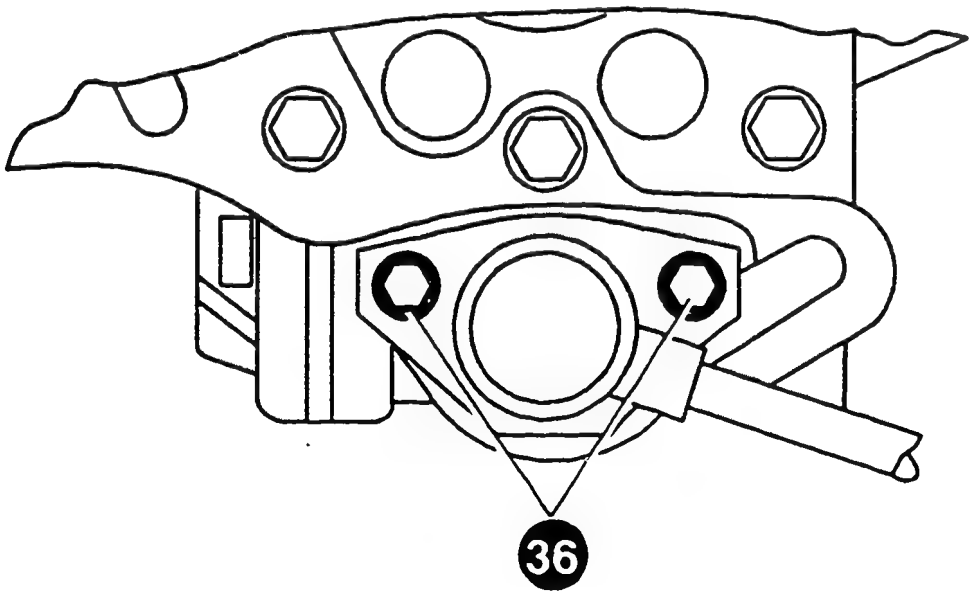


TIGHTENING TORQUES, PUMP WITH FREQUENCY VALVE

36 = Fillister-head screw/Torx bolt 10..14 Nm

Continue: A23/1 Fig.: A22/2

KMK03280

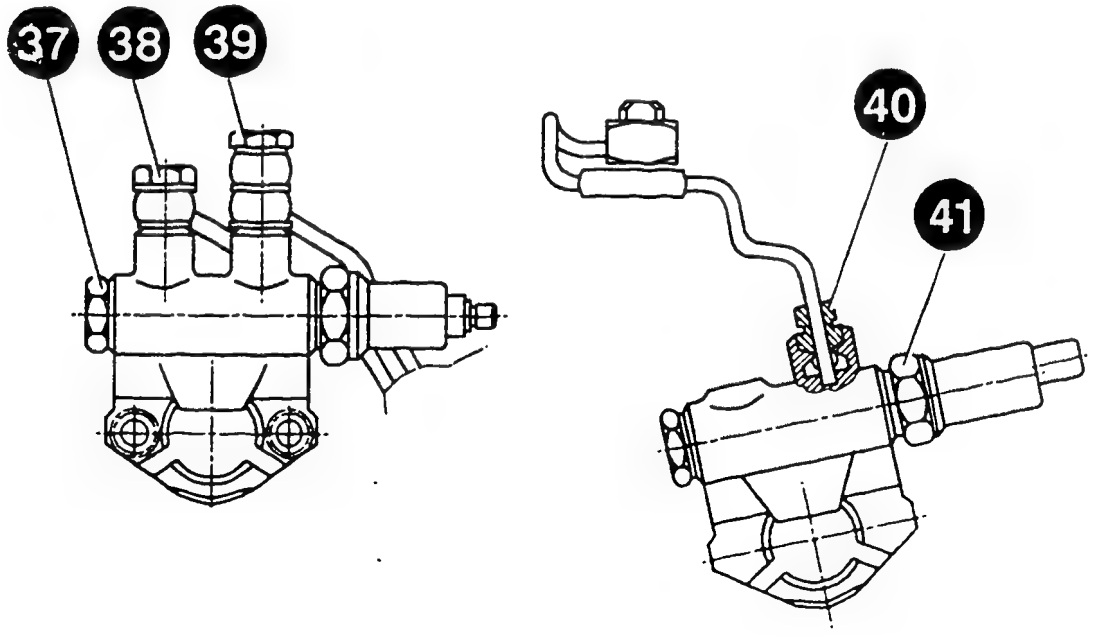


## TIGHTENING TORQUES, PUMP WITH HYDRAULIC KSB

| | |
|---|---|
| 37 = Valve insert | 10..15 Nm |
| 38 = Inlet-union screw | 8..12 Nm |
| 39 = Inlet-union screw | 8..12 Nm |
| 40 = Cap screw | 6..10 Nm |
| 41 = Thermo-element | 20..25 Nm |

Continue: A24/1 Fig.: A23/2

KMK03281

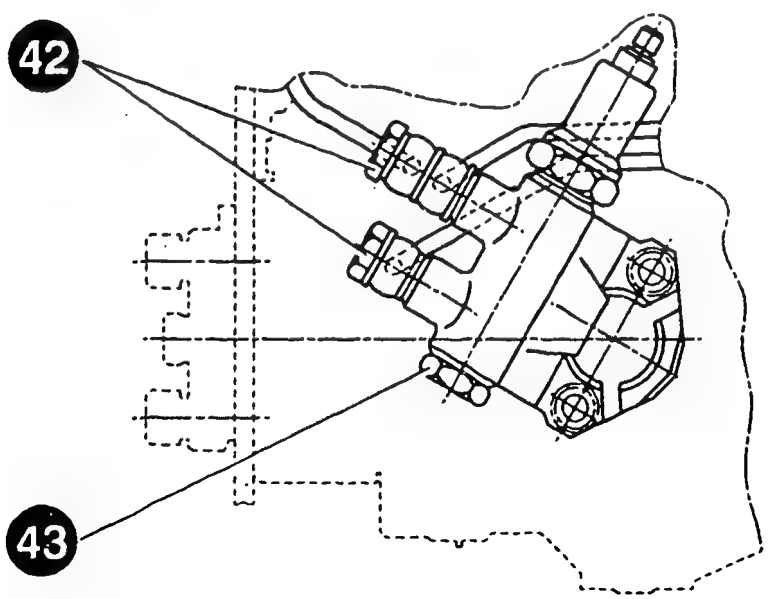


## TIGHTENING TORQUES, PUMP WITH HYDRAULIC KSB

| | | |
|---|---|---|
| 42 = | Inlet-union screw | 8.0...11.0 Nm |
| 43 = | Valve insert | 10.0...15.0 Nm |

Continue: A25/1 Fig.: A24/2

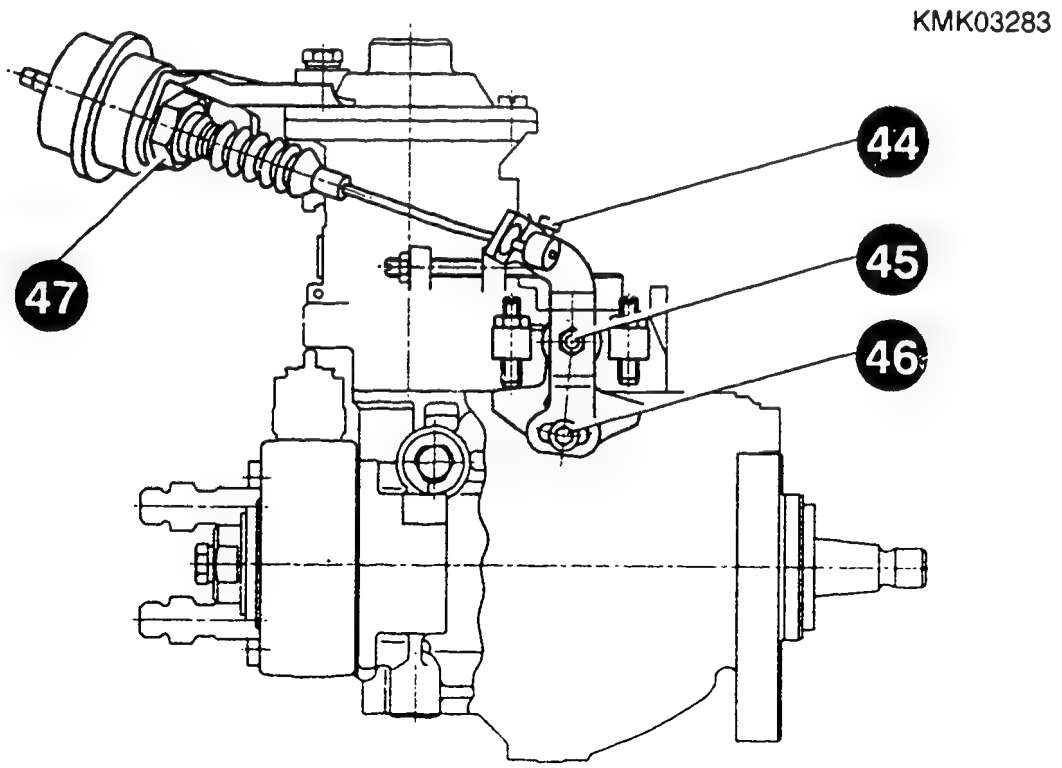
KMK03282



## TIGHTENING TORQUES, PUMP WITH PNEUMATIC IDLE INCREASE (PLA)

| | |
|---|---|
| 44 = Slotted screw | 2.0...3.0 Nm |
| 45 = Hexagon bolt | 3.0...5.0 Nm |
| 46 = Hexagon bolt | 5.0...7.0 Nm |
| 47 = Fastening nut | 20.0..25.0 Nm |

Continue: A26/1 Fig.: A25/2

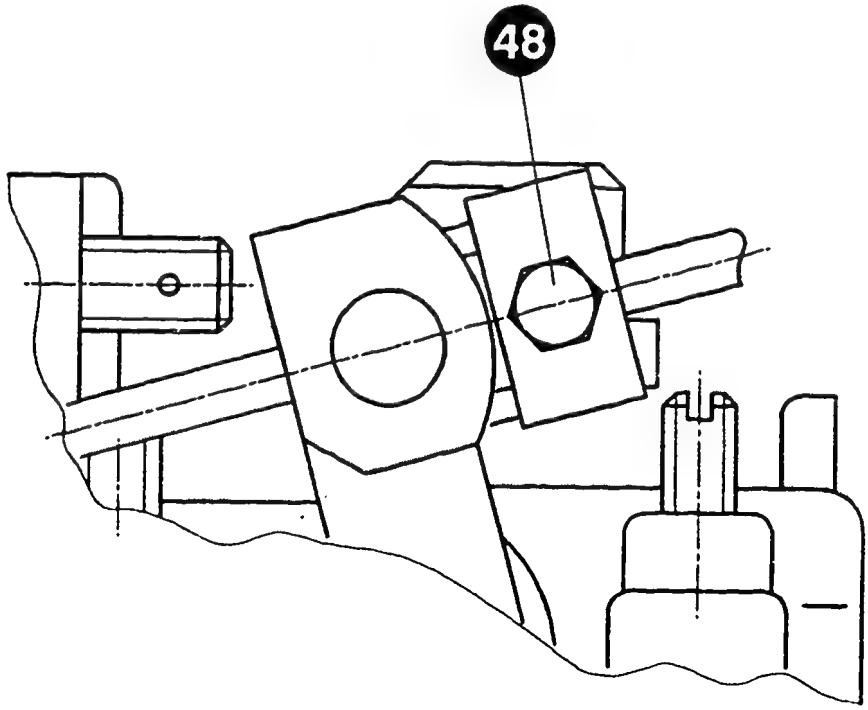


TIGHTENING TORQUES, PUMP WITH TEMPERATURE-DEPENDENT IDLE INCREASE (TLA)

48 = Hexagon bolt 2.0...3.0 Nm

Continue: A27/2 Fig.: A26/2

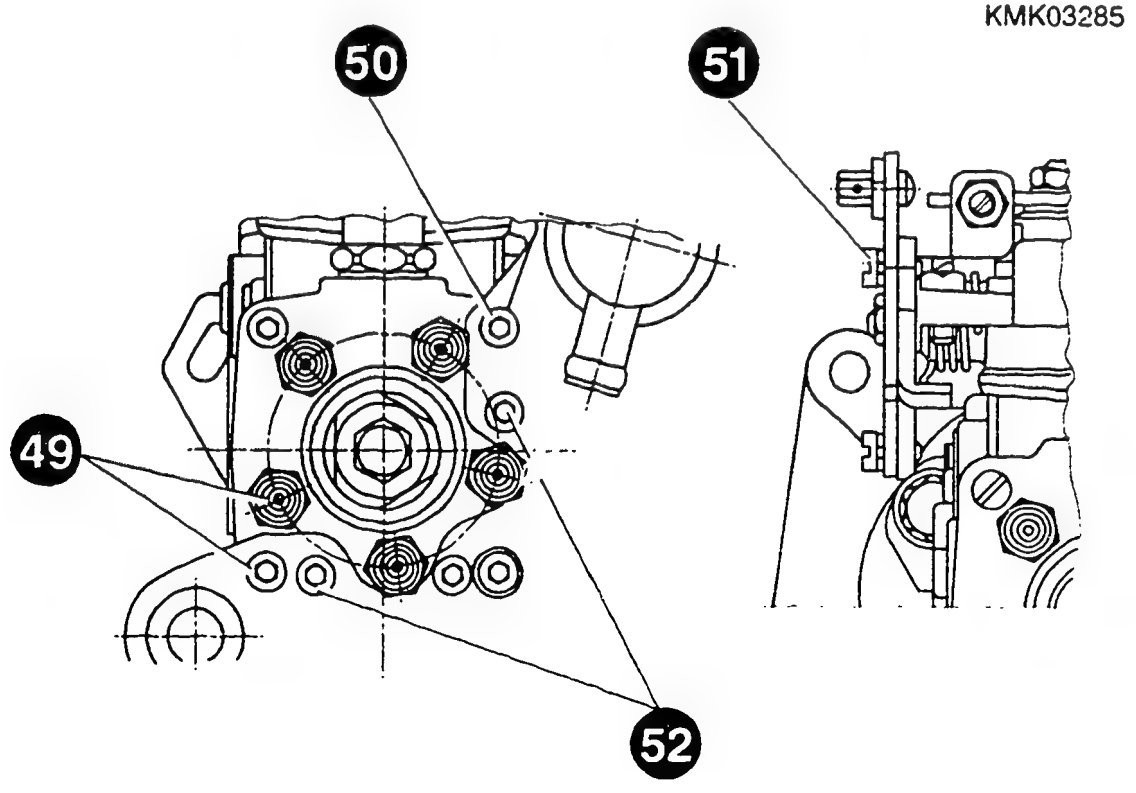
KMK03284



TIGHTENING TORQUES, PUMP WITH MOUNTING PLATE

| | |
|---|---|
| 49 = Torx bolt | 10...14 Nm |
| 50 = Torx bolt | 10...14 Nm |
| 51 = Fillister-head screw | 3... 5 Nm |
| 52 = Hexagon-socket-head cap screw | 7...10 Nm |

Continue: A28/1 Fig.: A27/2

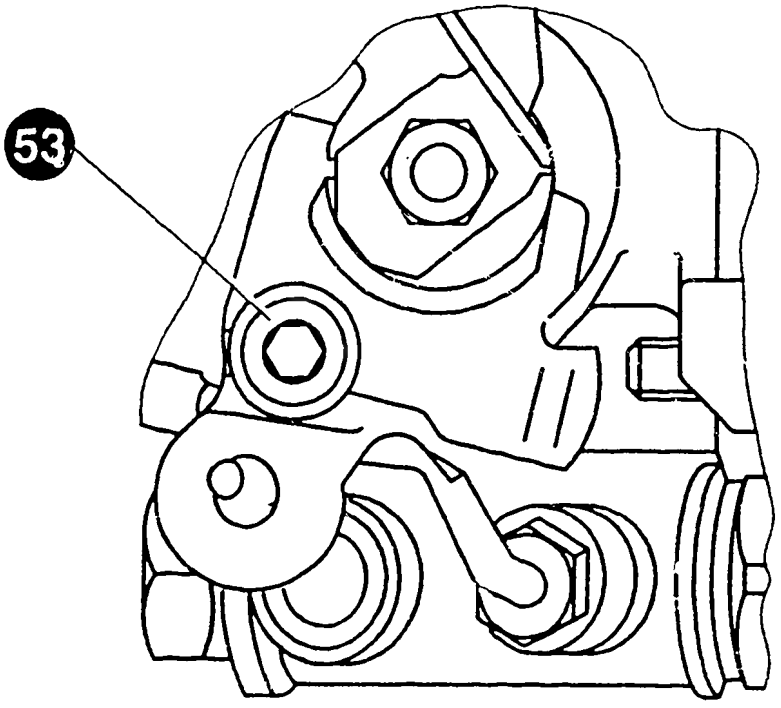


TIGHTENING TORQUES, PUMP WITH ANCILLARY LEVER FOR SPRING-ACTUATED POWER ON/OFF DAMPER

53 = Fastening screw 6... 9 Nm

Continue: B01/1 Fig.: A28/2

KMK03286

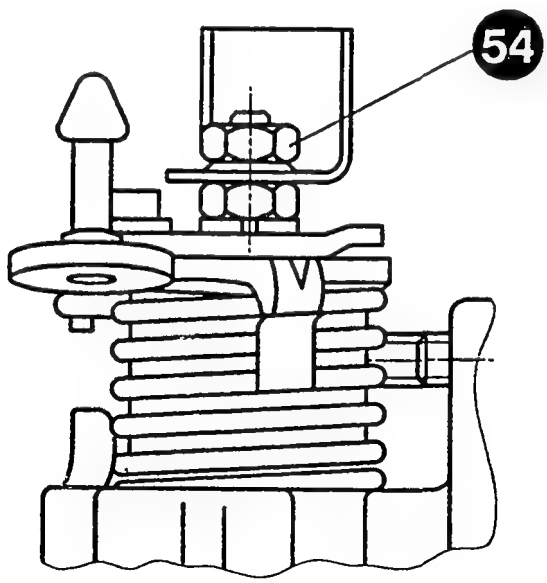


# TIGHTENING TORQUES, PUMP WITH STOP BRACKET FOR SWITCHING VALVE ADJUSTMENT

54 = Hexagon nut 5...10 Nm

Continue: B02/2 Fig.: B01/2

KMK03287

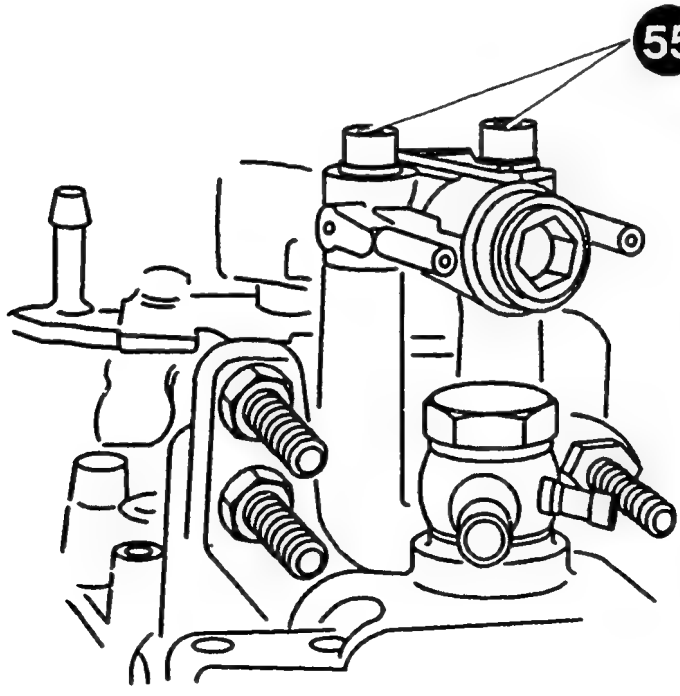


## TIGHTENING TORQUES, PUMP WITH SWITCHING VALVE

| | |
|---|---|
| 55 = Torx bolt M5 | 2... 3 Nm |

Continue: C01/2 Fig.: B02/2

KMK03288



COMPONENT REPAIR

Select component repair in line with following characteristics:

| | |
|---|---|
| * Central screw plug | C02/1 |
| * Overflow restriction | C03/1 |
| * Solenoid valve | C04/1 |
| * Speed-control lever | C05/1 |
| * Leakage at delivery-valve holder | C06/1 |
| * Renewing radial-lip-type oil seal | C07/1 |
| * Timing-device seal rings | C08/1 |
| * Renewing housing cover seal, control lever bearing | C09/1 |
| Complete repair | D04/1 |

Continue: C02/2

## TESTING CENTRAL SCREW PLUG

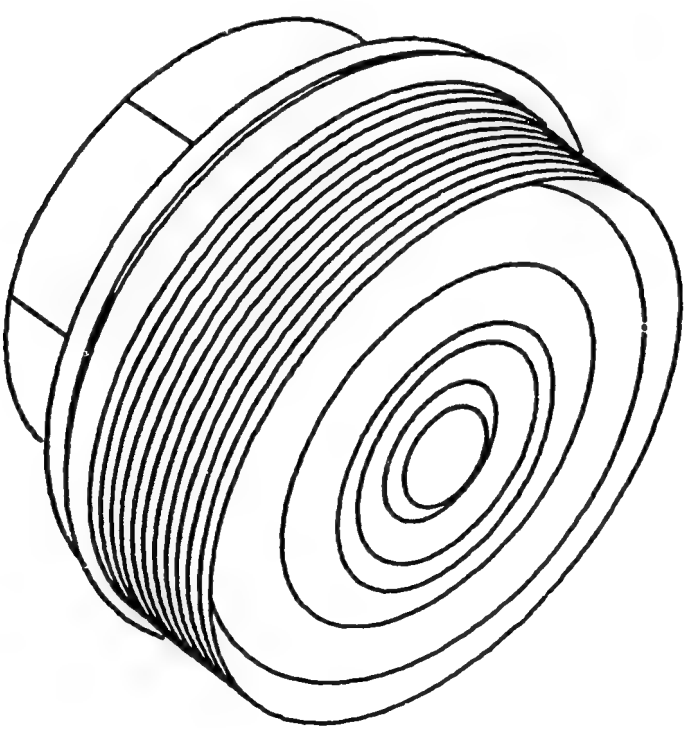
Check tightening torque in the event of leaks at the central screw plug.

Desired, max. 70 ... 90 Nm.

If tightening torque is correct, central screw plug is to be renewed (internal leakage).

Continue: C01/1 Fig.: C02/2

KMK03289



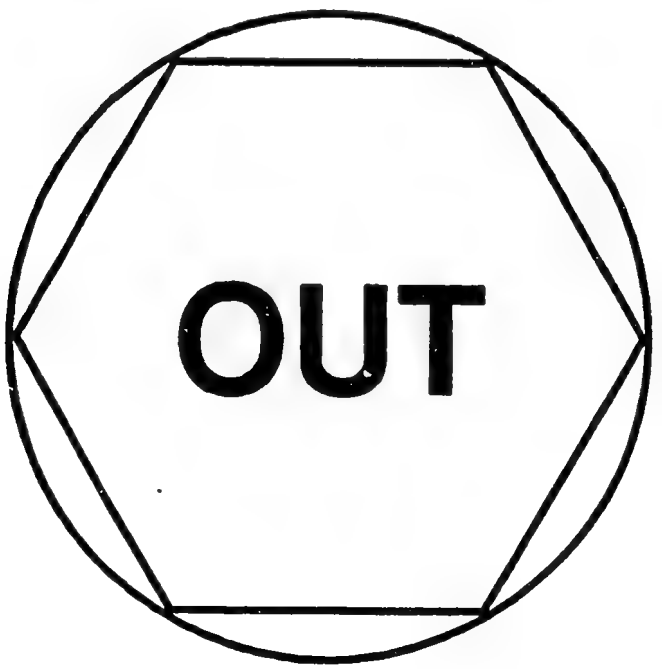
## TESTING OVERFLOW RESTRICTION

Screw out overflow restriction at fuel-injection pump (marked "out"). Visually inspect built-in strainer for dirt.

Renew overflow restriction in the event of doubt.

Continue: C01/1 Fig.: C03/2

KMK03290



## TESTING FUNCTION OF SOLENOID VALVE

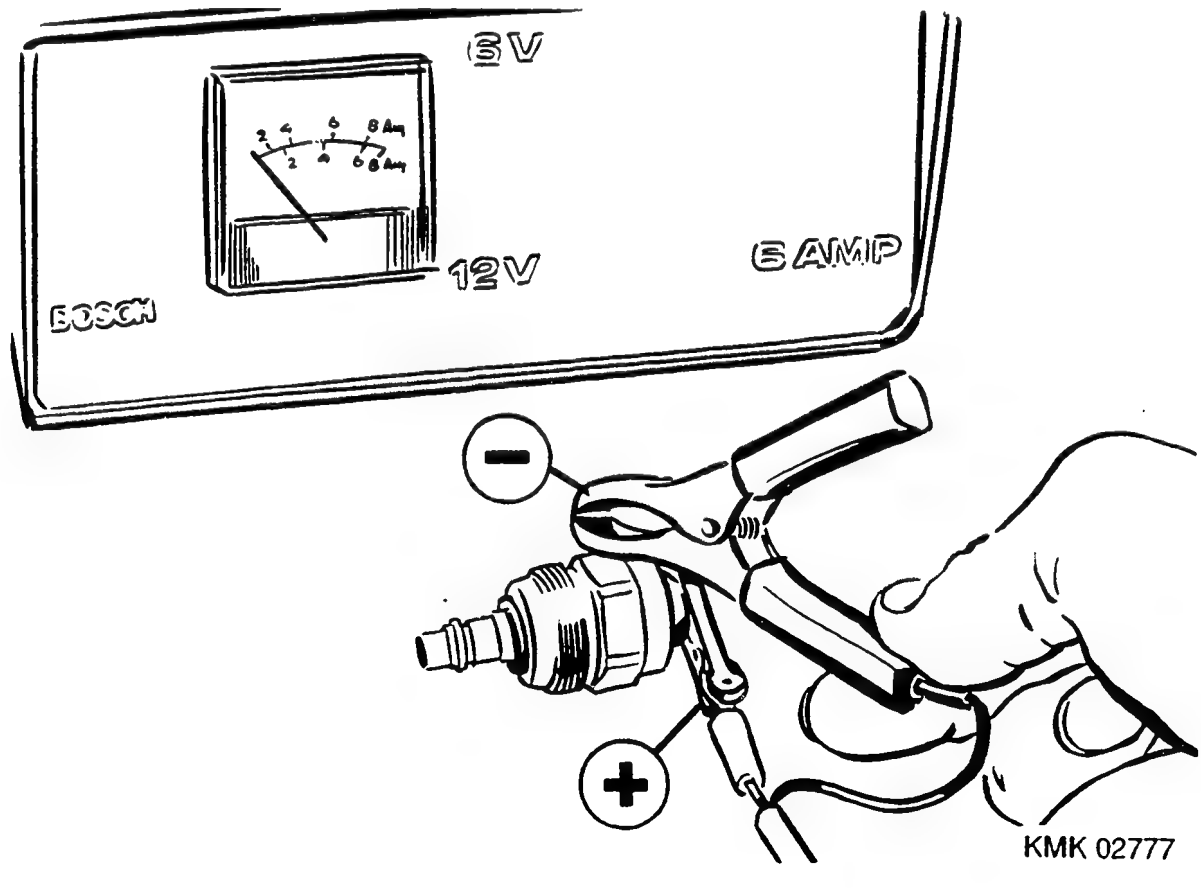
Remove fuel-injection tubing and take out solenoid valve.

Ensure cleanliness!

Check function of solenoid valve following removal (see picture).

Note:
After it has been removed, solenoid valve may only be briefly supplied with voltage since there is no fuel cooling.

Continue: C01/1 Fig.: C04/2



## SPEED-CONTROL LEVER STIFF

The problem is caused by a lack of lubrication at cylindrical helical coiled spring, stop bushing and cover. The grease may have been washed out of these components for example when washing engine.

If this is the case, control lever, cylindrical helical coiled spring and stop bushing must be thoroughly re-greased with multi-grade lubricant (it is also possible to use engine oil as a lubricant).

Continue: C01/1

LEAKAGE AT DELIVERY-VALVE HOLDER AND BLEEDER SCREW

Loosen delivery-valve holder and tighten it to prescribed tightening torque 38 ... 42 Nm.

If delivery-valve holder still leaks, renew appropriate holder and gasket.

NOTE
Re-install delivery-valve assemblies with springs and shims in same distributor outlet.
Only use torque wrench to tighten delivery-valve holder.

Continue: C06/2

Renew seal if bleeder screw is leaking.

Tighten bleeder screw to tightening torque of 20 ... 26 Nm.

Continue: C01/1

## RENEWING RADIAL-LIP-TYPE OIL SEAL

Use extractor KDEP 1113 or KDEP 1114 to pull radial-lip-type oil seal out of pump housing.

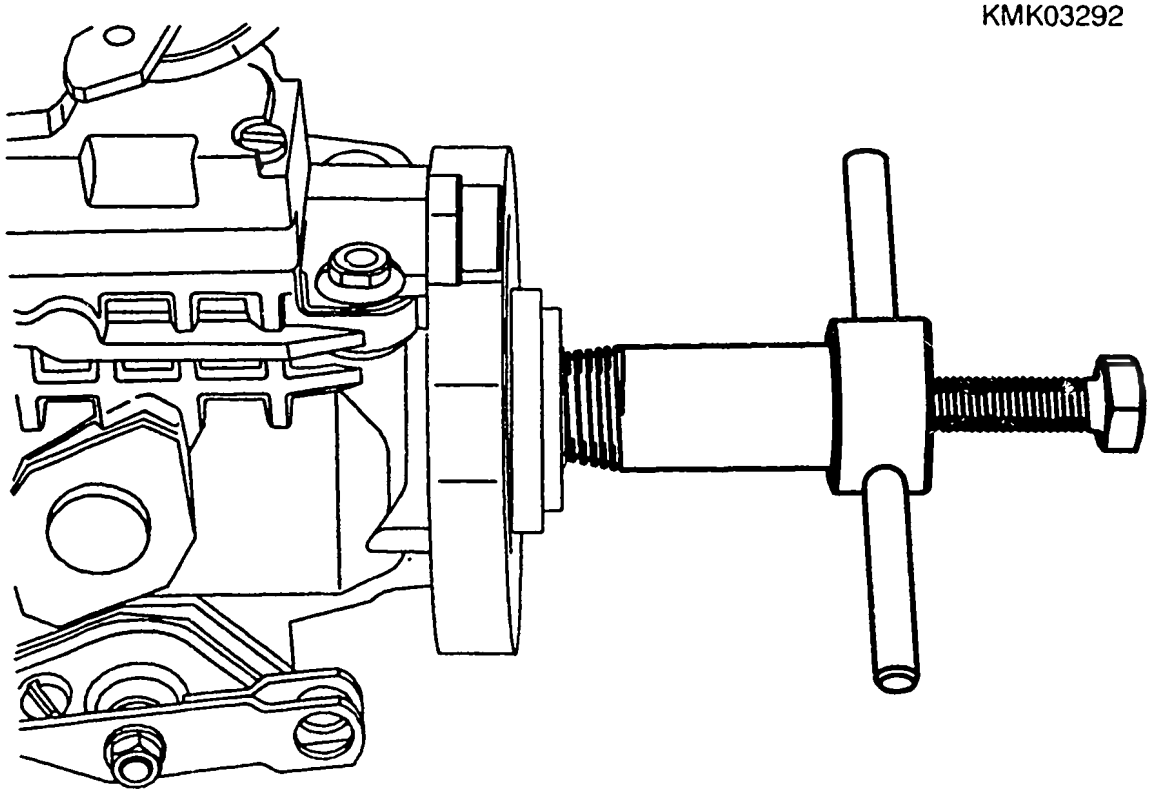
Attach assembly sleeve KDEP 2939 to drive shaft.

Install new radial-lip-type oil seal with mandrel press.

NOTE
Take care not to damage sealing lip and seal-ring spring.

Continue: C01/1 Fig.: C07/2

KMK03292



## RENEWING TIMING-DEVICE SEALS

1 = O-rings

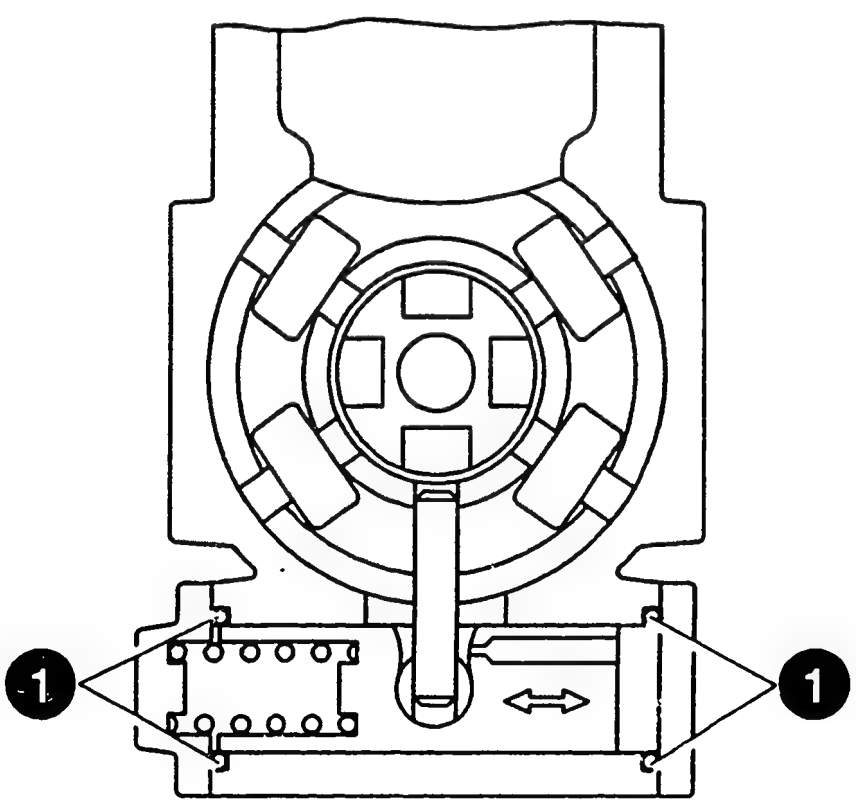
Disassemble timing-device cover.
Examine O-rings for damage.
Replace damaged O-ring.

Re-install timing-device cover.

Note: If delivery end of timing device is provided with KSB, this must be removed first.

Continue: C01/1 Fig.: C08/2

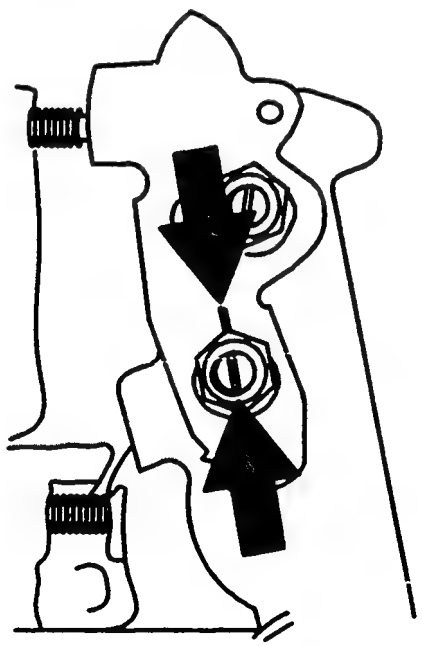
KMK03293



## RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

Remove overflow restriction and drain distributor-type fuel-injection pump.
Attach distributor-type fuel-injection pump with flange and support clamp KDEP 2963 to clamping support KDEP 2919.
Mark control lever and setting shaft with respect to one another (arrows).

Continue: C10/1 Fig.: C09/2



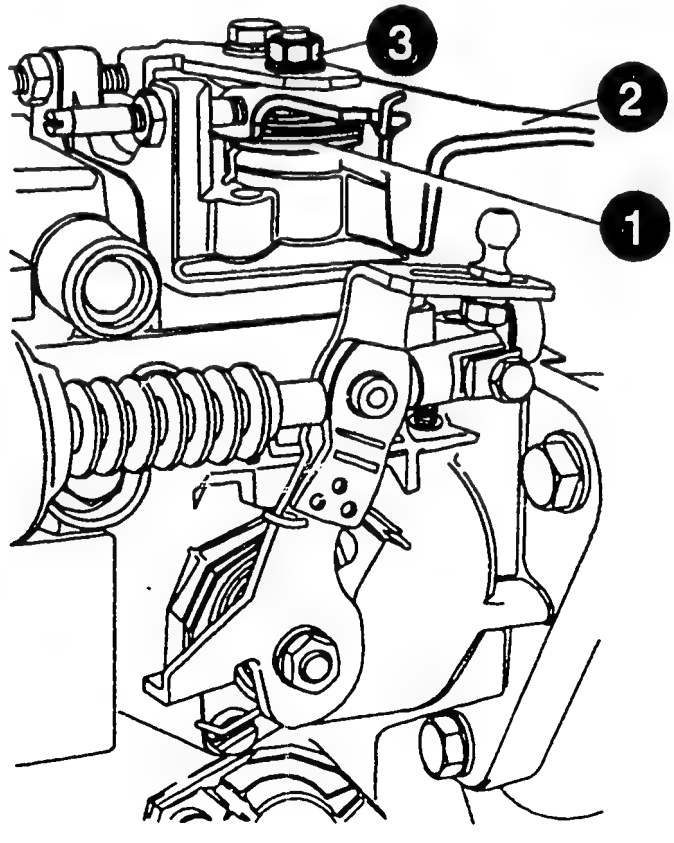
KMK02289

RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

1 = Cylindrical helical coiled spring
2 = Control lever
3 = Hexagon nut with spring lock washer

Disengage cylindrical helical coiled spring.
Remove hexagon nut with spring lock washer.
Pull off control lever.
Remove fastening screws of housing cover.

Continue: C11/1 Fig.: C10/2




KMK03294

## RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

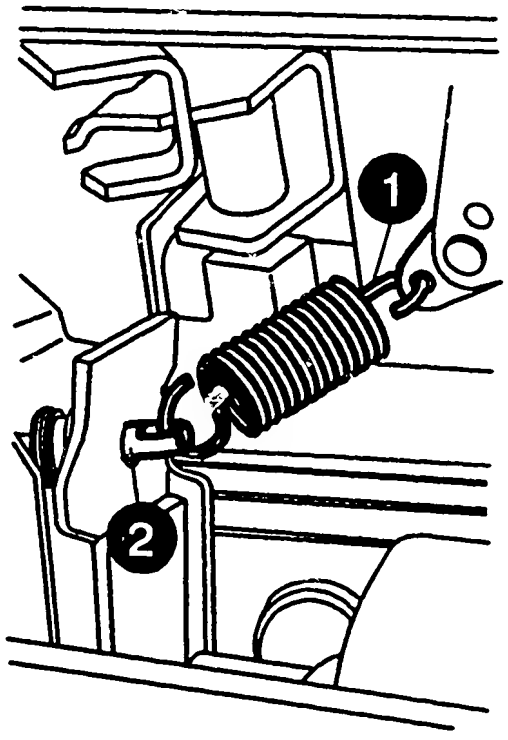
1 = Extension spring
2 = Retaining pin with compression spring

Raise housing cover and disengage extension spring from retainng pin.

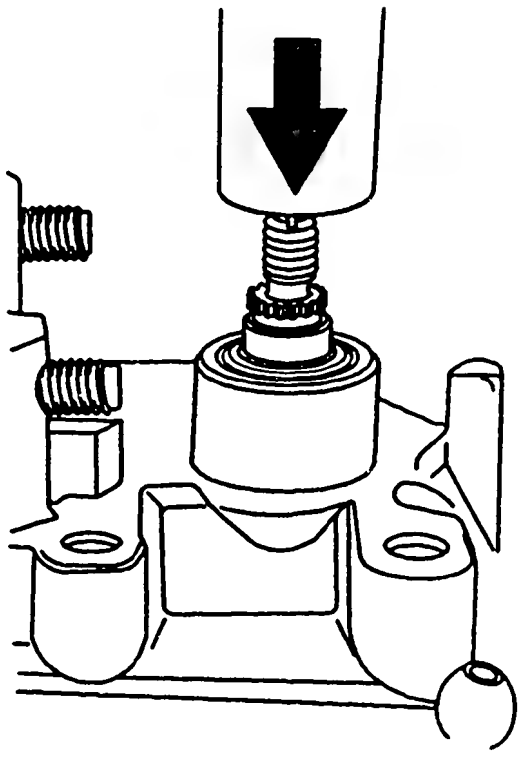
Set down retaining pin with compression springs. Disengage extension spring from setting shaft.

Press through setting shaft in direction of inside of cover.

Continue: C12/1 Fig.: C11/2




KMK03295



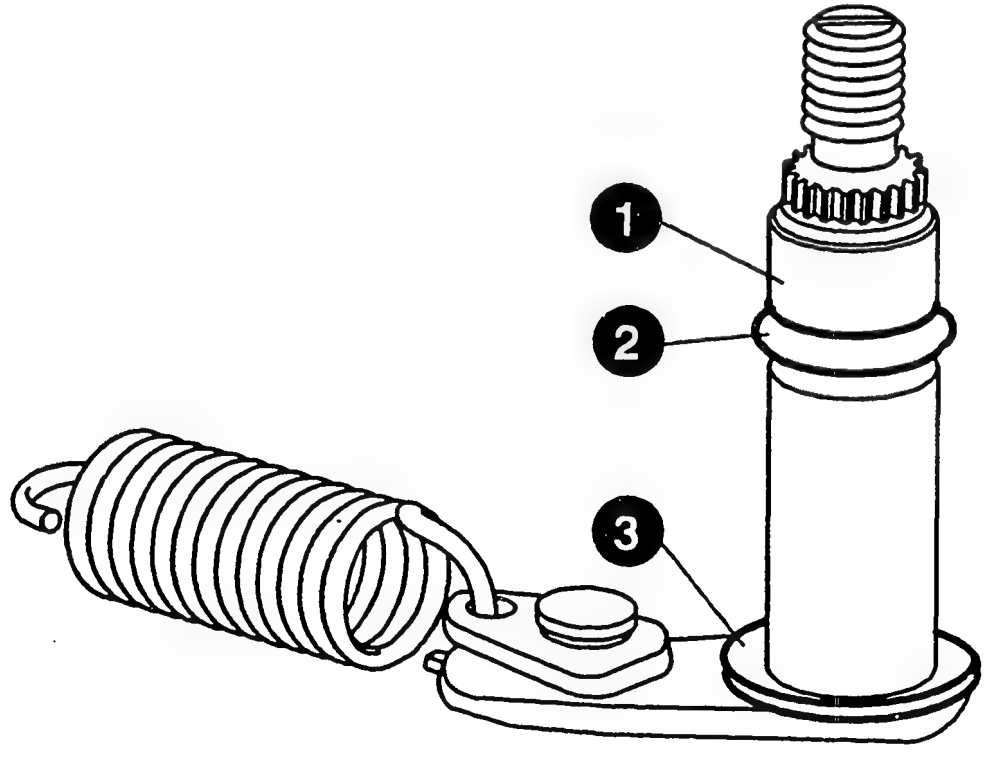
## RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

1 = Setting shaft
2 = O-ring
3 = Washer

Remove O-ring and shim from setting shaft. Remove housing cover. Take seal ring out of housing cover.

Continue: C13/1 Fig.: C12/2

KMK03296



RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

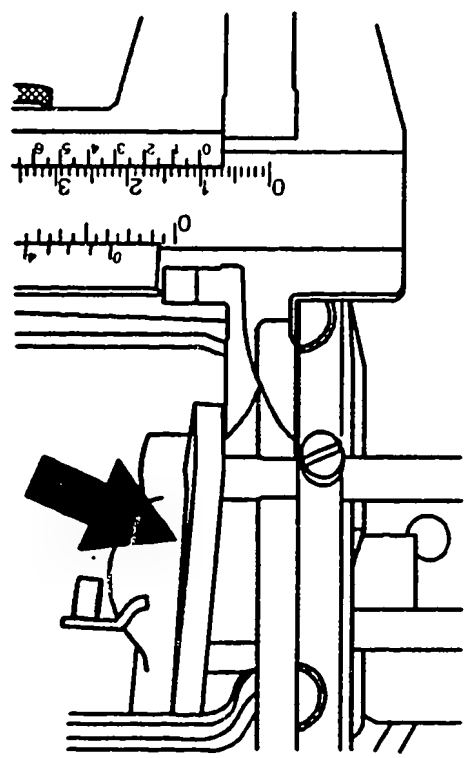
* Remove full-load screw

Remove full-load screw if necessary. Before removing full-load screw, measure screw-in depth with KDEP 1152/3 and note down dimension.

NOTE:
New full-load screw is set to measured dimension again on assembly.

Continue: C14/1 Fig.: C13/2

KMK03297



RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

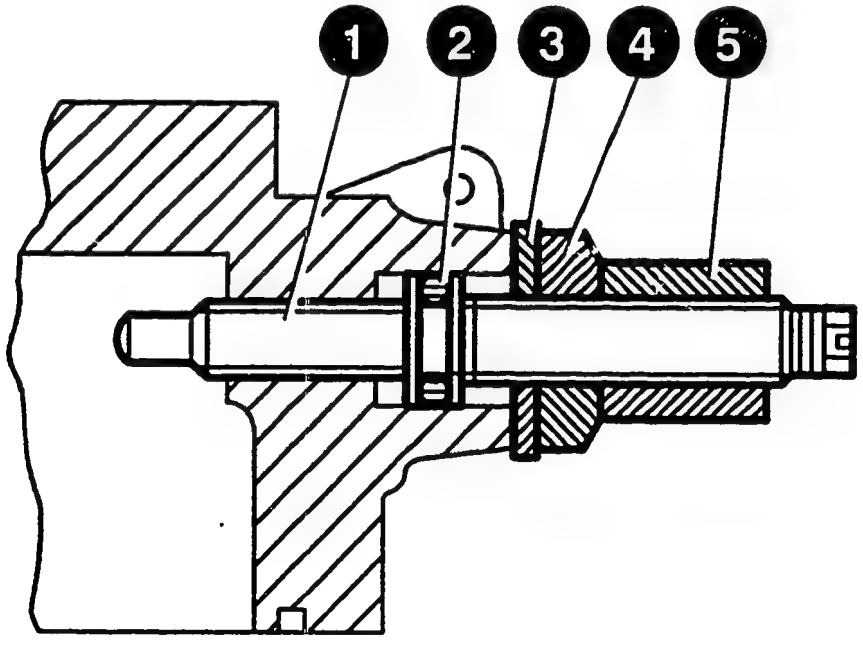
* Remove full-load screw

1 = Threaded pin (full-load adjusting screw)
2 = O-ring
3 = Washer
4 = Hexagon nut
5 = Retaining sleeve

Remove threaded pin with hexagon nut, washer, retaining sleeve and O-ring.

Continue: C15/1 Fig.: C14/2

KMK03298



RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

Select further repairs in line with following features:

* Remove pump with temperature-dependent excess fuel quantity regulator (TAS) C16/1

* Pump with no TAS C18/1

Continue: C16/1

RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

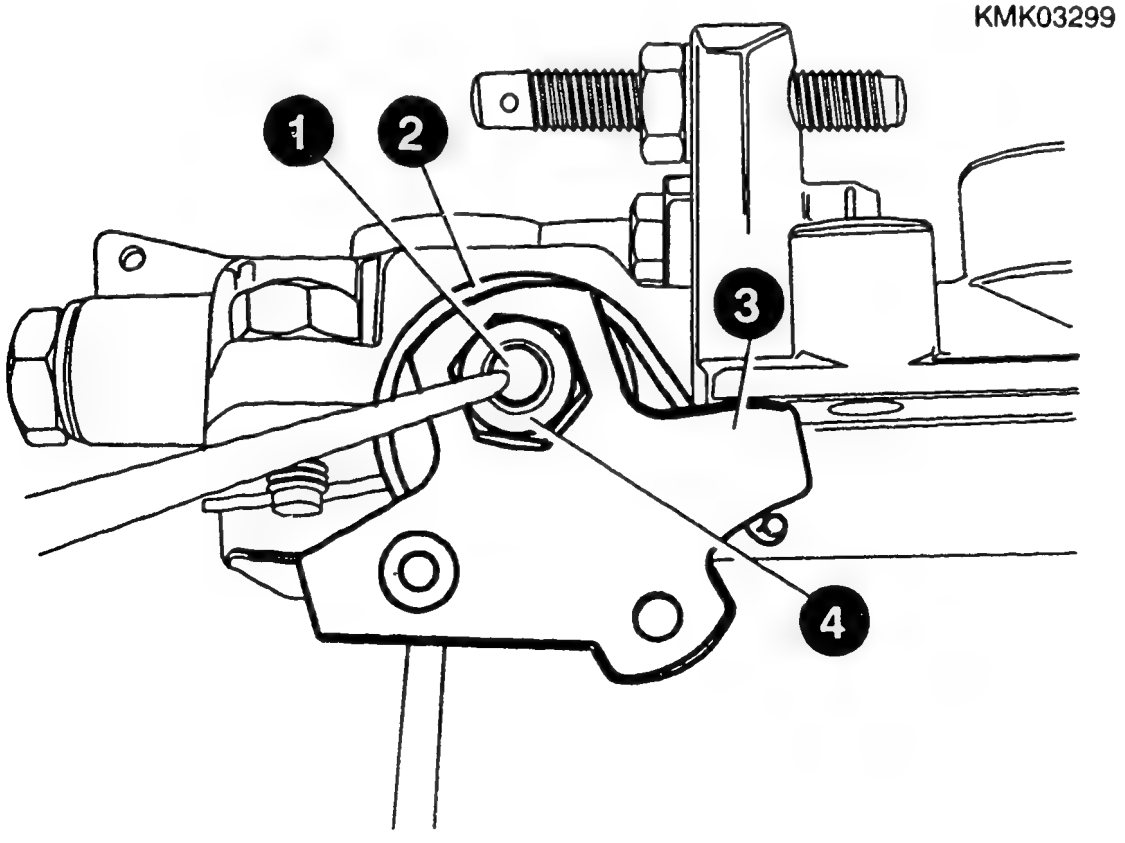
* Remove TAS

1 = Lever shaft
2 = Cylindrical helical coiled spring
3 = Regulating lever
4 = Hexagon nut with spring lock washer

Remove temperature-dependent excess fuel quantity restrictor (TAS). Disengage cylindrical helical coiled spring (if appropriate). Mark position of regulating lever/stop lever in the case of mechanical stop with respect to lever shaft (see picture). Remove hexagon nut with spring lock washer. Pull off regulating lever.

Continue: C17/1 Fig.: C16/2

KMK03299



## RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

* Remove TAS

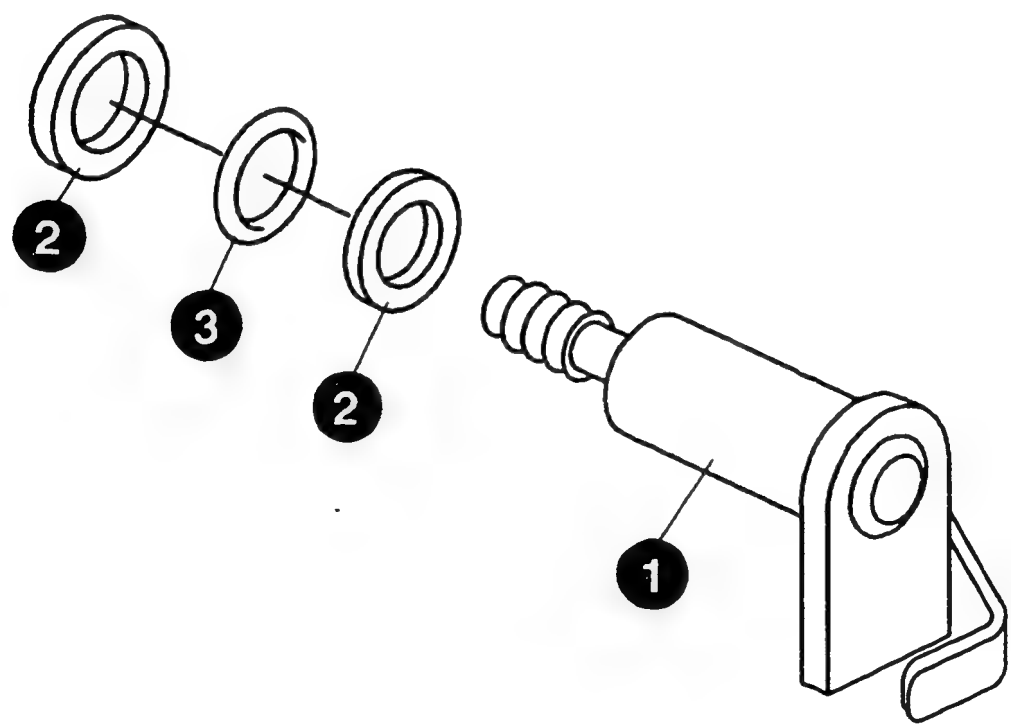
1 = Lever shaft
2 = Shims
3 = O-ring

Pull lever shaft out of housing cover.

Remove shims and O-ring.

Continue: C18/1 Fig.: C17/2

KMK03300

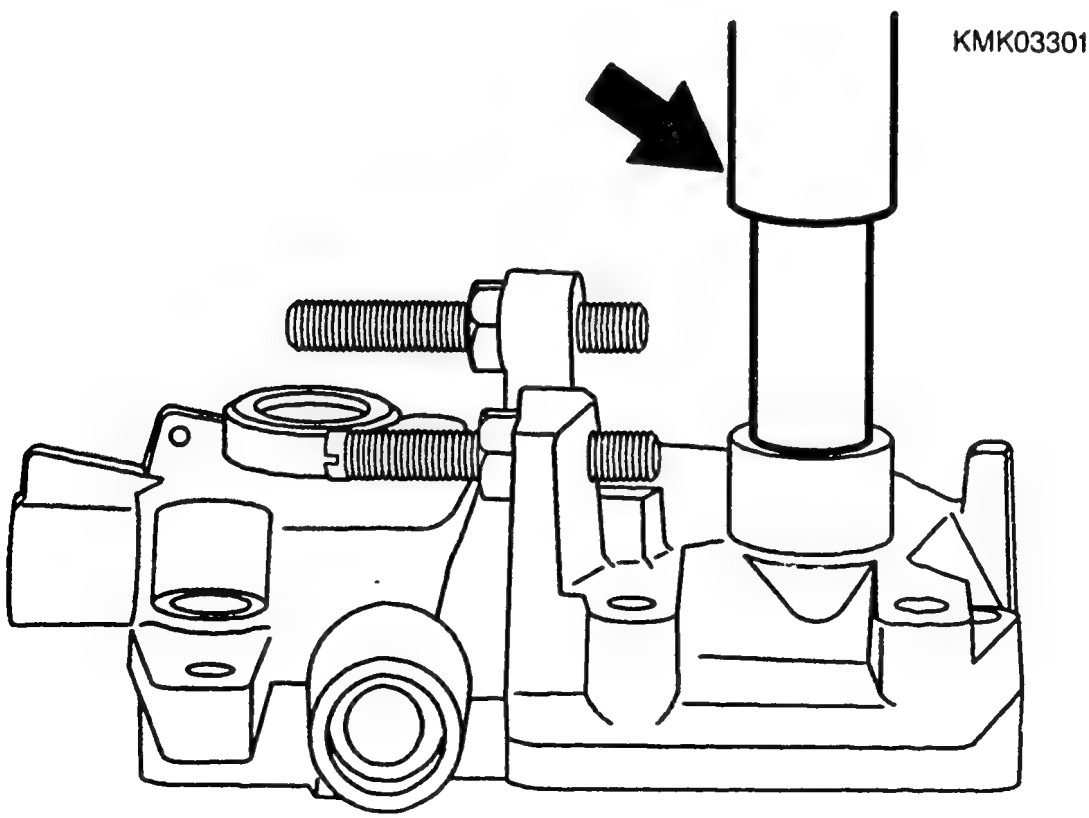


## RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

* REPLACEMENT OF BUSHING IN HOUSING COVER

Press out bronze bushing with appropriate mandrel KDEP 1132/0/1 (arrow). Wash out housing cover; there must be no grease in hole for bushing. Examine hole in housing cover for longitudinal scoring or similar damage. Use new housing cover if freedom from leaks between bushing and housing cover hole does not appear to be guaranteed.

Continue: C19/1 Fig.: C18/2



RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

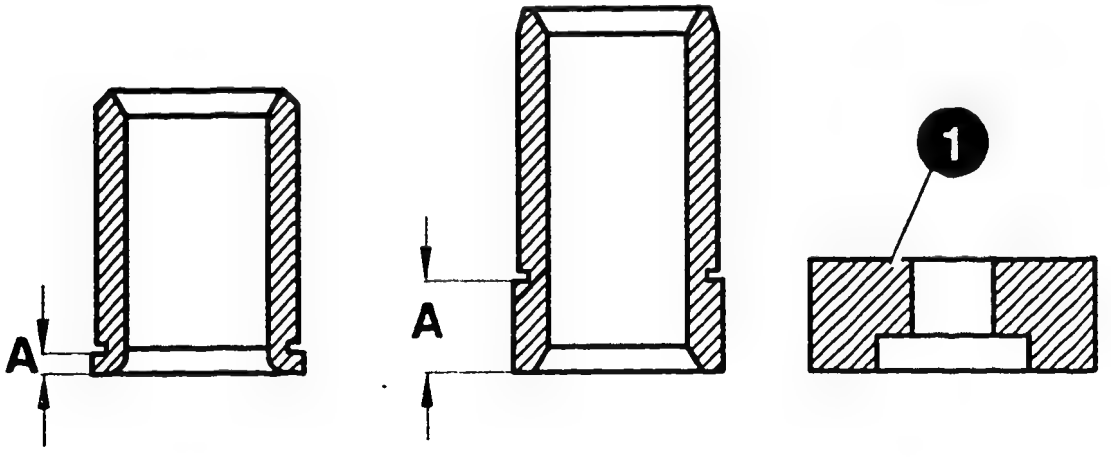
* REPLACEMENT OF BUSHING IN HOUSING COVER

A = Height of collar
1 = Spacer

Place spacer with countersink in correct position on housing cover in line with steel-bushing design (2.5 or 7.0 mm collar height).
2.5 mm collar: countersink towards pressing-in mandrel; 7.0 mm collar: countersink towards housing.

Continue: C20/1 Fig.: C19/2

KMK03302



RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

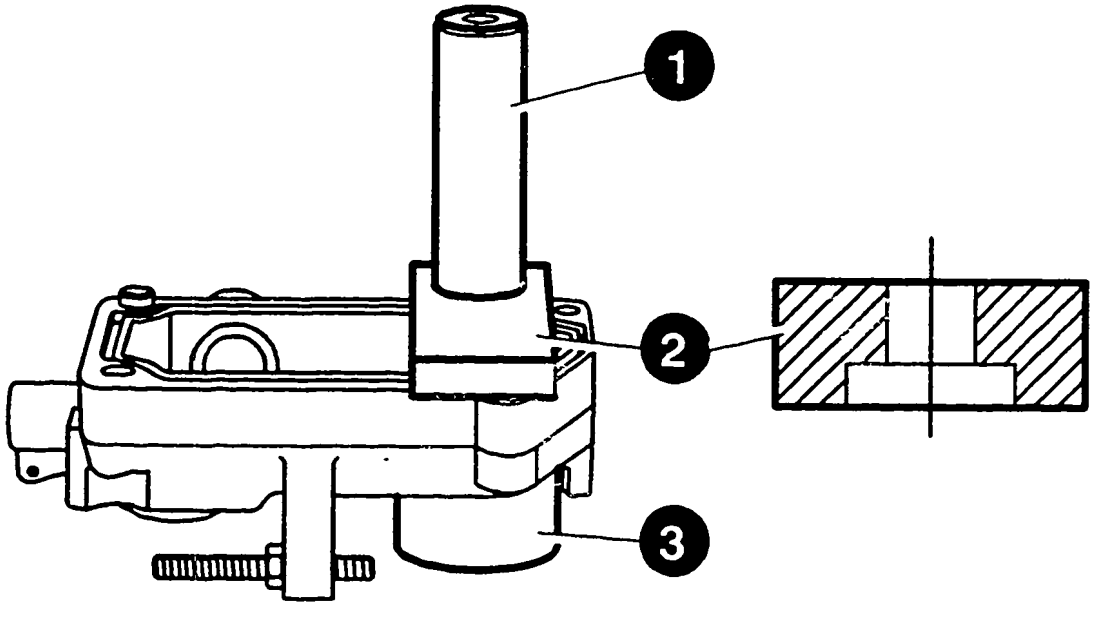
* REPLACEMENT OF BUSHING IN HOUSING COVER

1 = Pressing-in mandrel
2 = Spacer
3 = Support ring

Place housing cover on support ring.
Apply "Loctite 582" to O.D. of steel bushing.
Press in steel bushing with pressing-in mandrel straight and flush until it makes contact with pin in countersink or spacer.

Continue: C21/2 Fig.: C20/2

KMK03303



RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

* HOUSING COVER ASSEMBLY

Select further assembly in accordance with following features:

* Pump with variable-speed governor C22/1

* Pump with part-load governor
  Version with detachment surfaces C25/1

  With no detachment surfaces C26/1

Continue: C22/1

RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

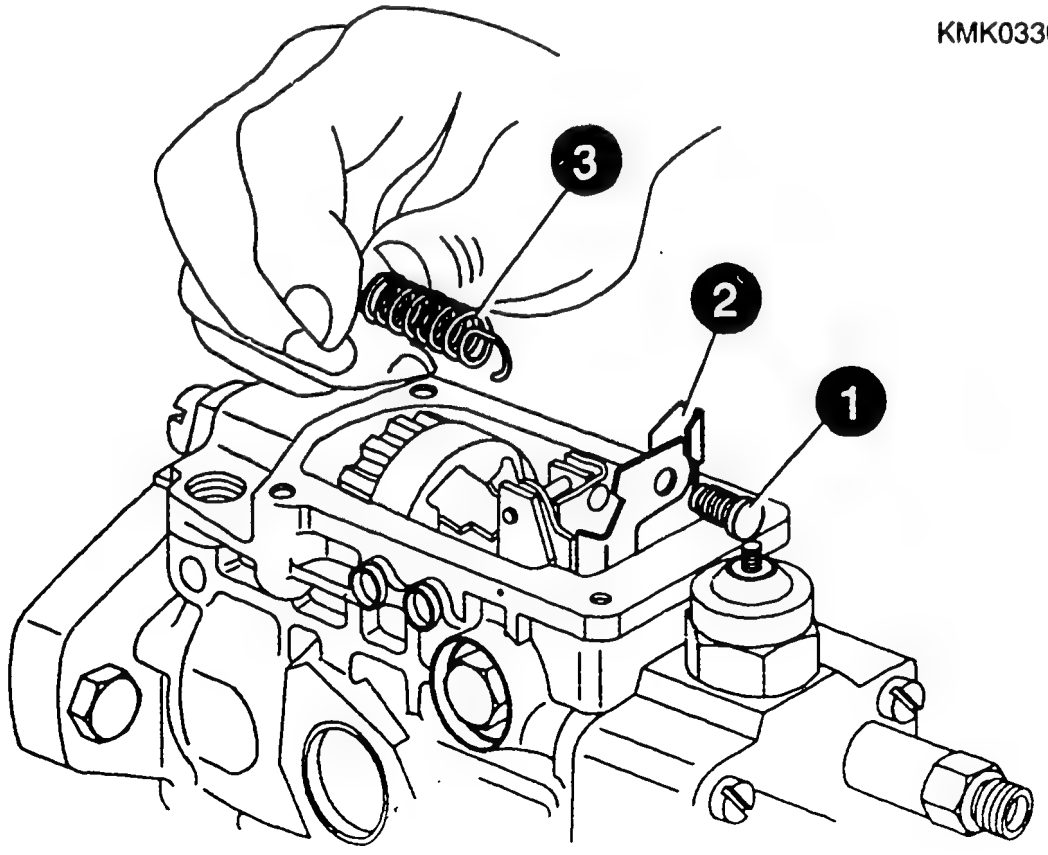
* Pump with variable-speed governor

1 = Retaining pin
2 = Tensioning lever
3 = Governor spring

Engage governor spring in retaining pin of tensioning lever.
Note:
Retaining pin and compression spring are to be viewed as one unit and may only be replaced together (parts set).

Continue: C23/1 Fig.: C22/2

KMK03304



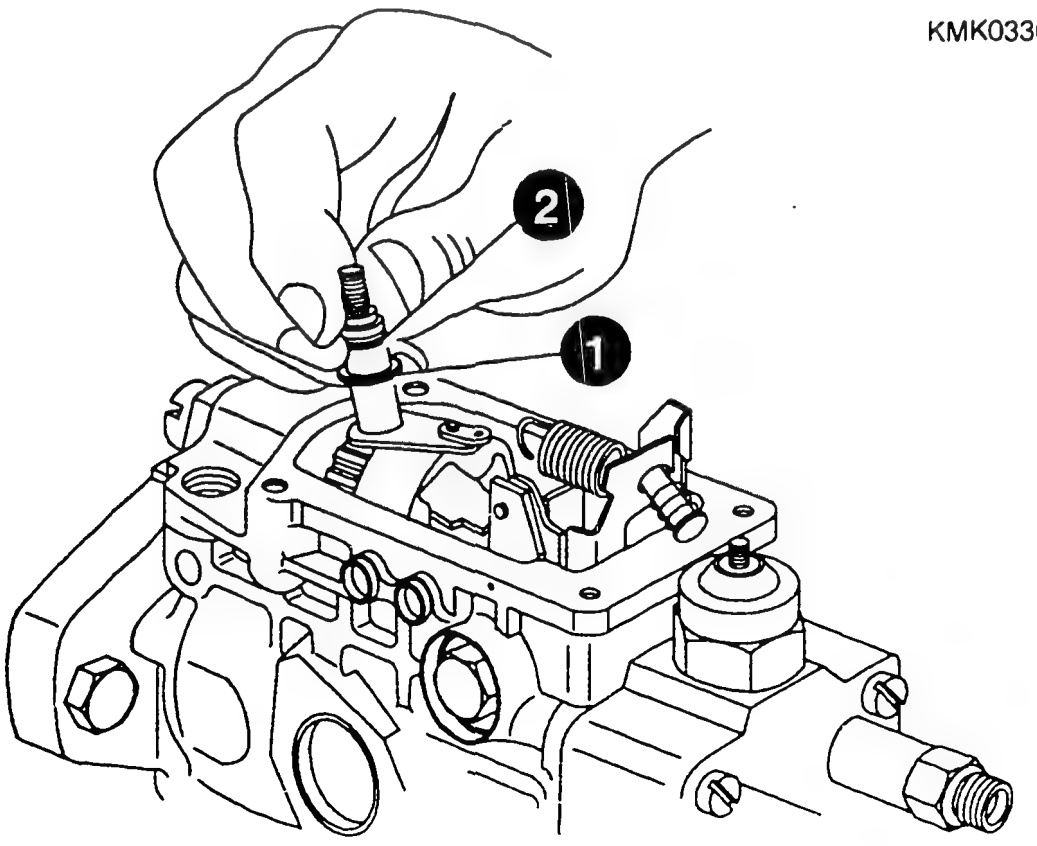
RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT
* Pump with variable-speed governor

1 = Shim
2 = O-ring

Attach shim and O-ring to control lever shaft.
Engage governor spring on joint of setting shaft.
Make sure that eyelet opening faces downwards.
Grease O-ring of setting shaft before installing setting shaft in governor cover.

Continue: C24/1 Fig.: C23/2

KMK03305

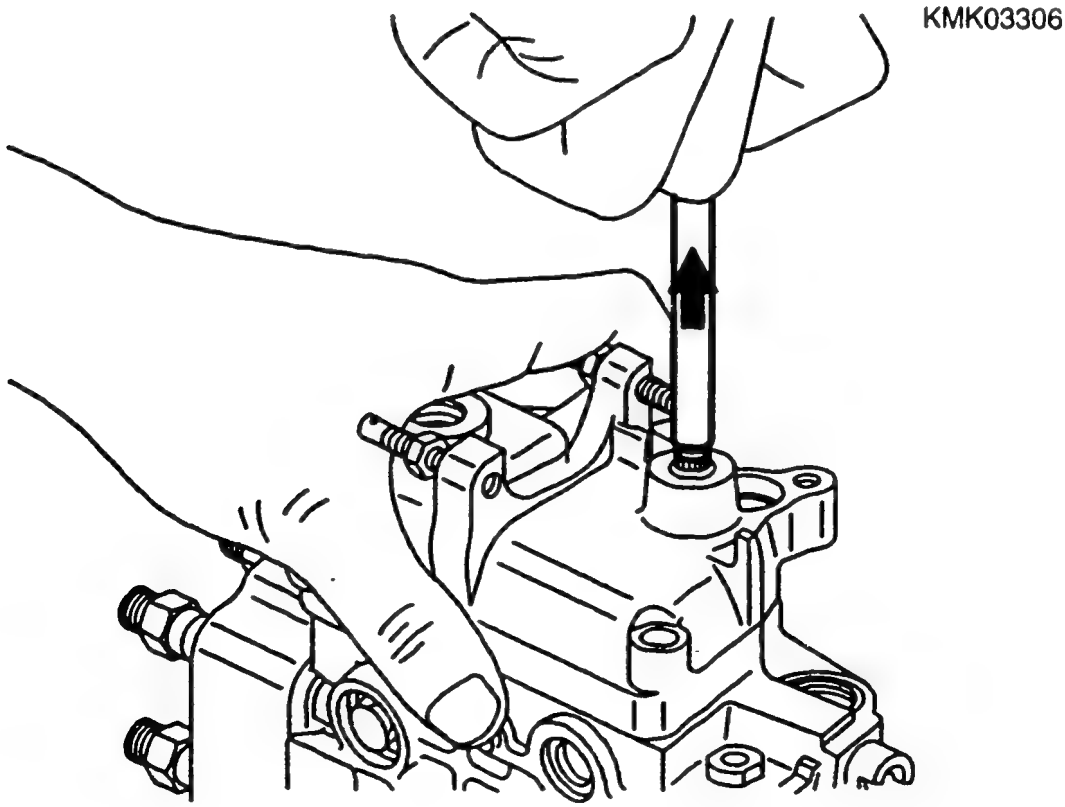


RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

* Pump with variable-speed governor

Screw in full-load stop screw (if removed) with O-ring.
Screw in full-load screw to screw-in depth (determined on removal) with KDEP 1152/3.
Place housing cover with new seal on pump housing.
Pull setting shaft with assembly wrench KDEP 1096 through housing cover (arrow).
Secure housing cover.

Continue: D01/1 Fig.: C24/2



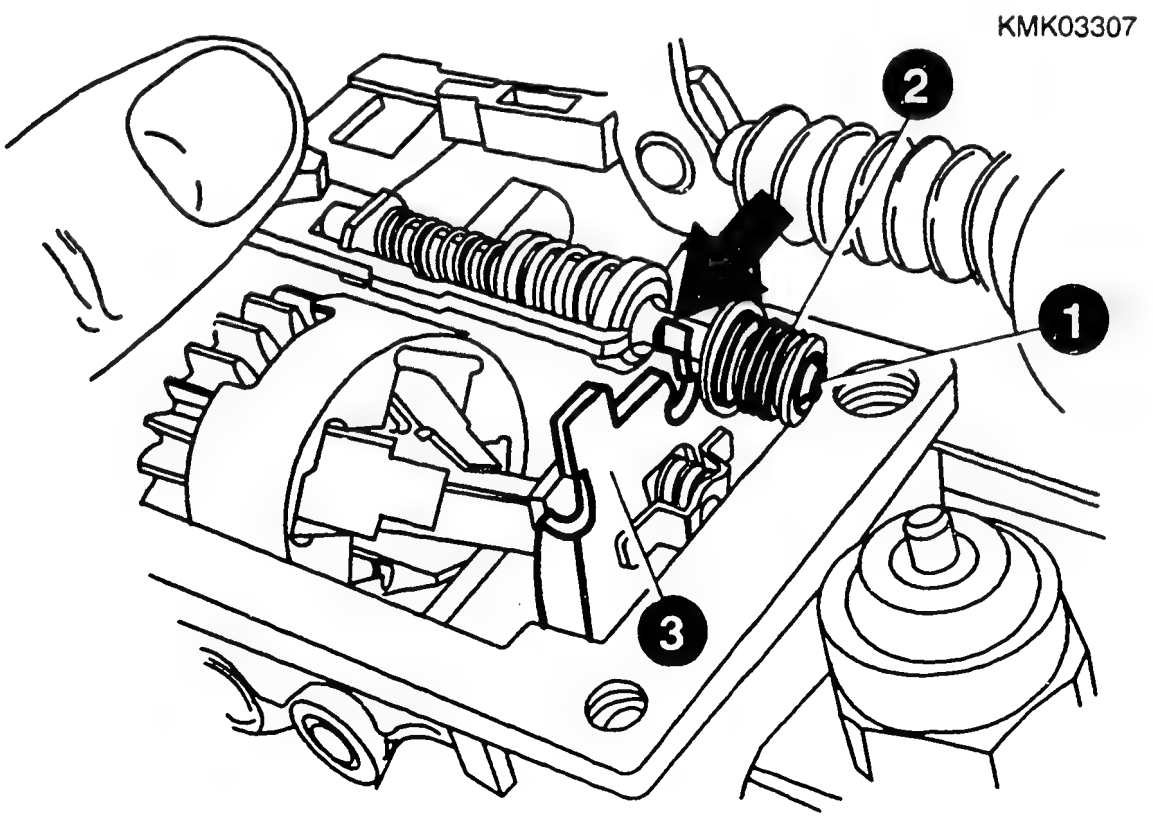
RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

* Pump with part-load governor
  Version with detachment surfaces

1 = Retaining pin
2 = Intermediate spring
3 = Tensioning lever

Engage milled surfaces (arrow) of part-load governor in part-load governor such that retaining pin and intermediate spring are behind tensioning lever.

Continue: C27/1 Fig.: C25/2



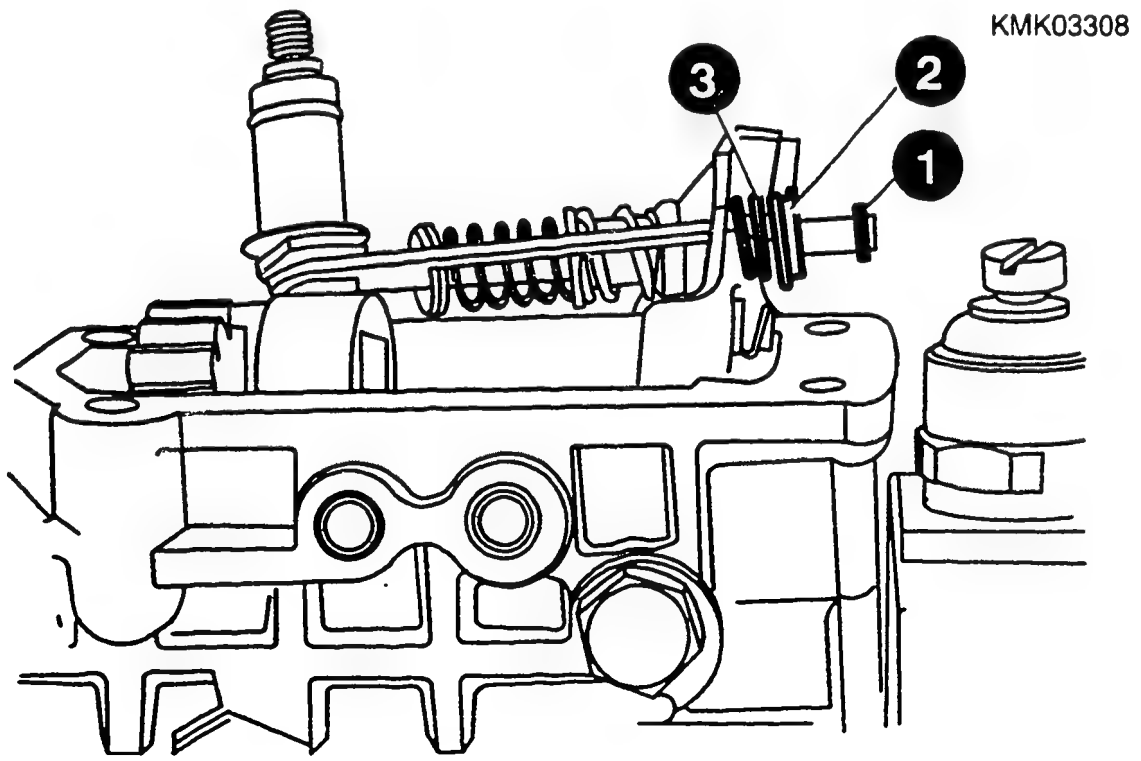
RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

* Pump with part-load governor
  Version with no detachment surfaces

1 = Retaining ring
2 = Retaining pin
3 = Intermediate spring

Insert part-load governor with setting shaft into fulcrum lever assembly.
Slip intermediate spring and retaining pin onto guide pin (part-load governor).
Attach retaining ring to guide pin.

Continue: C27/1 Fig.: C26/2



RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT
* Pump with part-load governor

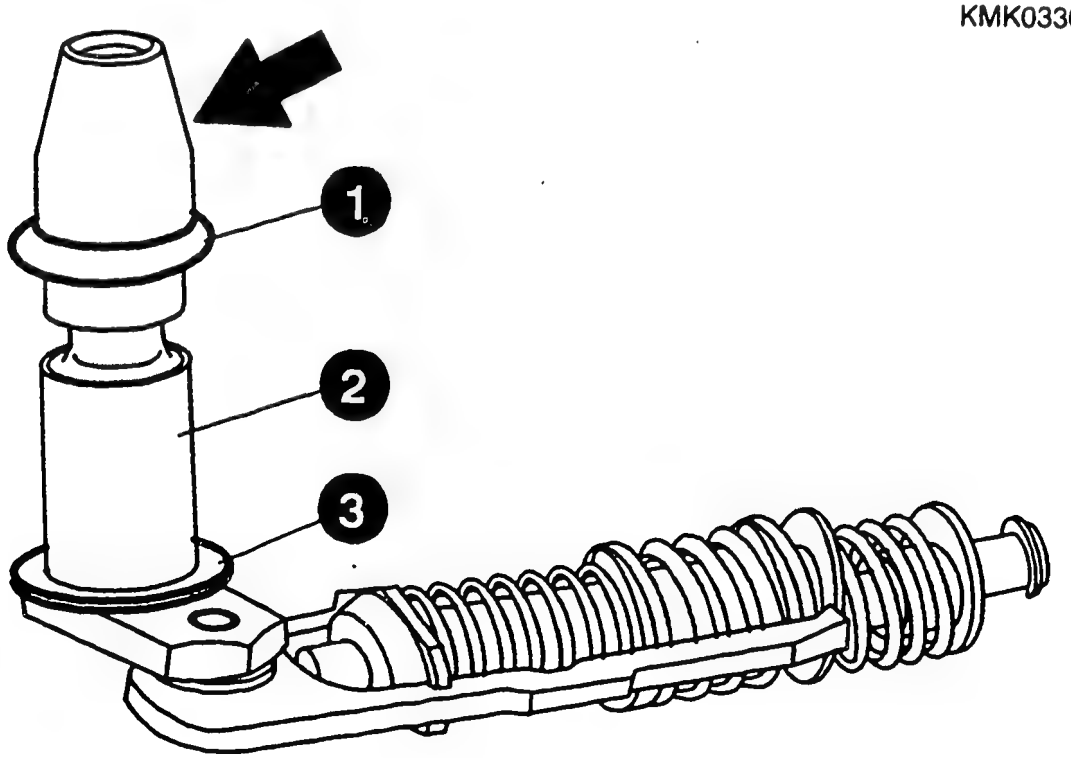
1 = O-ring
2 = Setting shaft
3 = Shim

Fit shim.
Install assembly sleeve KDEP 2937 on setting shaft to protect O-ring.

Slip on O-ring.

Continue: C28/1 Fig.: C27/2

KMK03309

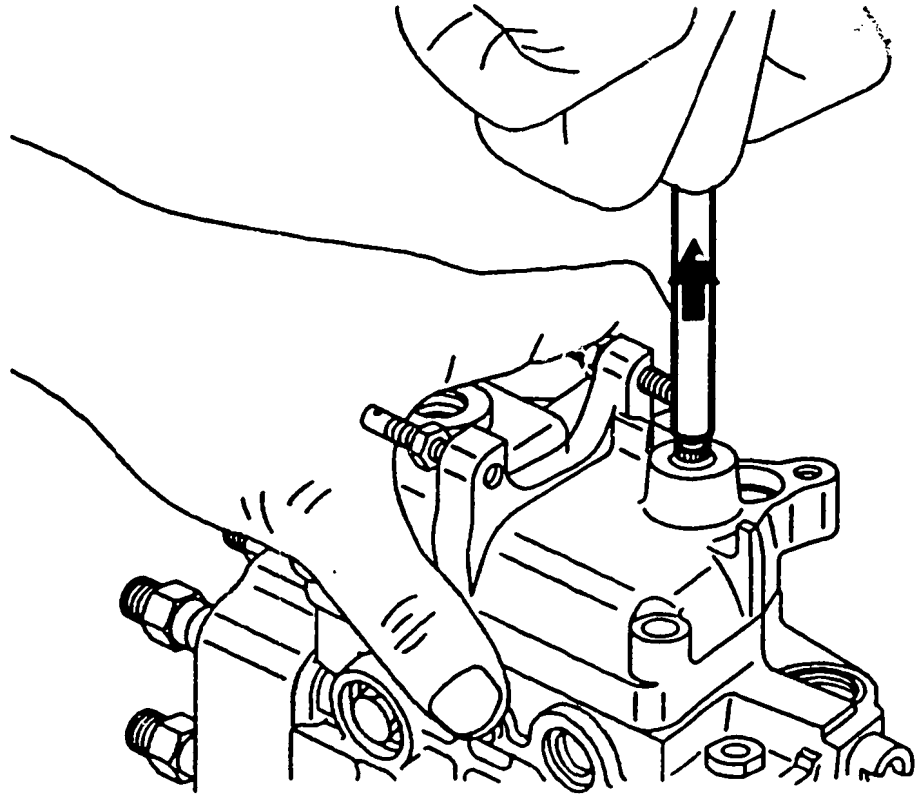


RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT
* Pump with part-load governor

Screw in full-load stop screw (if removed) with O-ring.
Screw in full-load stop screw to screw-in depth (determined on removal) with KDEP 1152/3.
Attach housing cover with new seal to pump housing.
Pull assembly shaft with assembly wrench KDEP 1096 through housing cover (arrow).

Secure housing cover.

Continue: D01/1 Fig.: C28/2



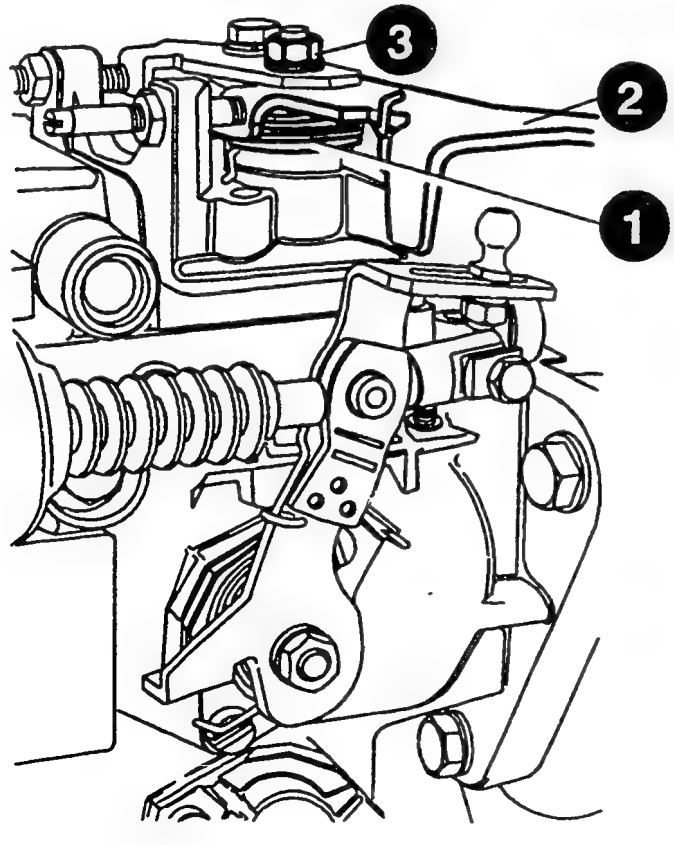
RENEWING HOUSING COVER SEAL, CONTROL LEVER BUSHING AND O-RING ON CONTROL LEVER SHAFT

* Housing cover attachment

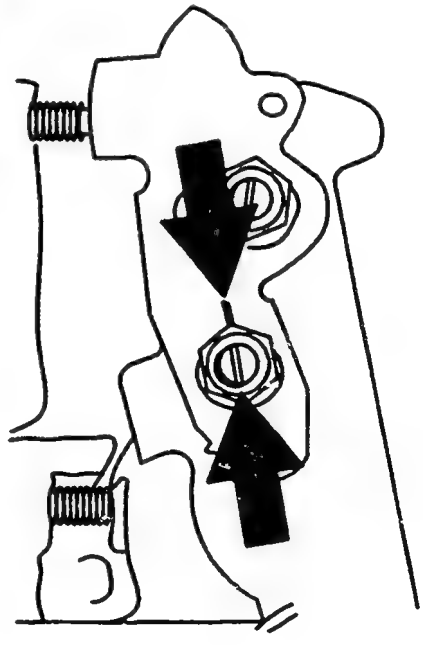
1 = Cylindrical helical coiled spring
2 = Control lever
3 = Hexagon nut

Fit cylindrical helical coiled spring and control lever. Attach control lever to setting shaft such that marks on control lever and setting shaft coincide (arrows).
Screw on hexagon nut.

Continue: D02/1 Fig.: D01/1




KMK03310



## ASSEMBLING AND ATTACHING HOUSING COVER

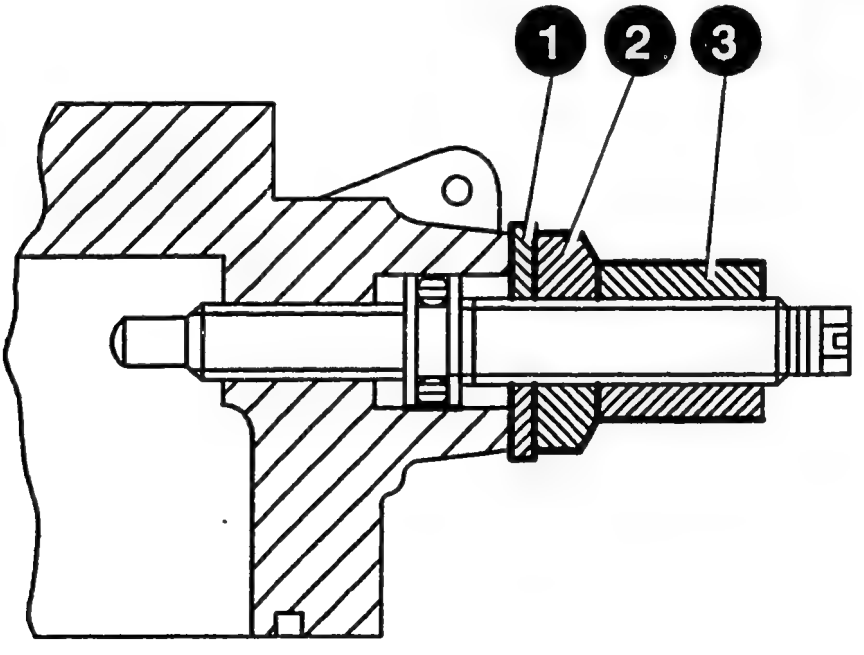
1 = Washer
2 = Hexagon nut
3 = Retaining sleeve

Attach washer, hexagon nut and retaining sleeve to pump housing.

Tighten fastening screws of housing cover.

Continue: D03/1 Fig.: D02/2

KMK03311



## CHECKING HOUSING COVER FOR LEAKS

Functional strength of Loctite 582 is attained after approx. 45 minutes at ambient temperature.
Close off overflow on distributor-type fuel-injection pump with screw plug.
Establish compressed-air connection on intake side of distributor-type fuel-injection pump, place pump in calibrating-oil tank and apply 8 bar test pressure. No air bubbles may emerge between bushing and housing cover within test period (pressure retention time) of 20 seconds.

Continue: C01/1

## DISASSEMBLING FUEL-INJECTION PUMP

* Removal of coupling half

Select removal of drive coupling as per illustration:

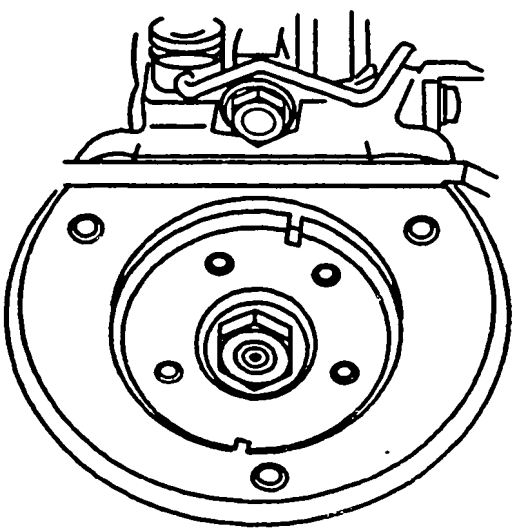
* Removing coupling half with release screws, left picture — D05/1

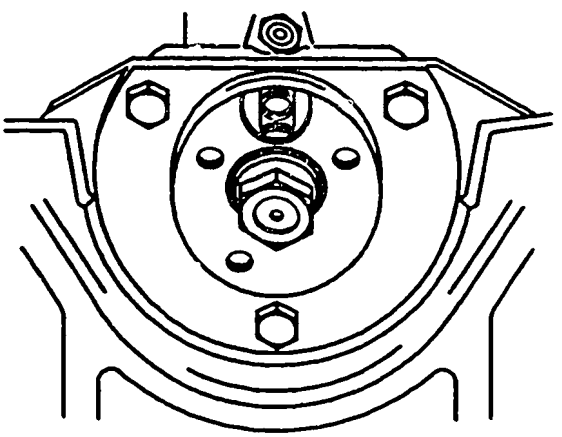
* Removing coupling half with extractor, right picture — D07/1

* Removing coupling half with intermediate flange (not illustrated) — D08/1

Continue: D05/1 Fig.: D04/2

KMK03312





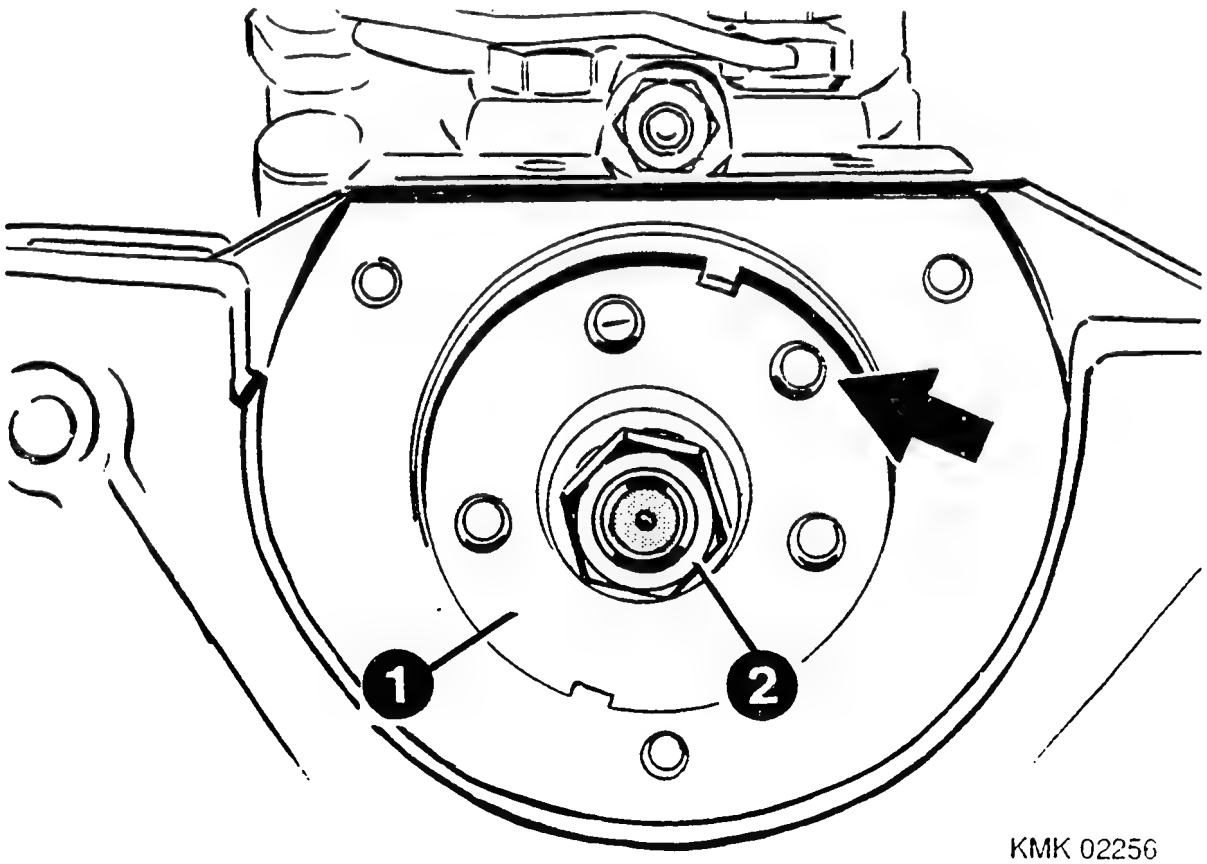
REMOVING COUPLING HALF
* With release screws

1 = Coupling half
2 = Fastening nut

Counterhold coupling half with hook wrench (commercially available).
Loosen fastening nut.

NOTE:
Do not counterhold coupling half by setting at setting hole (arrow).

Continue: D06/1 Fig.: D05/2



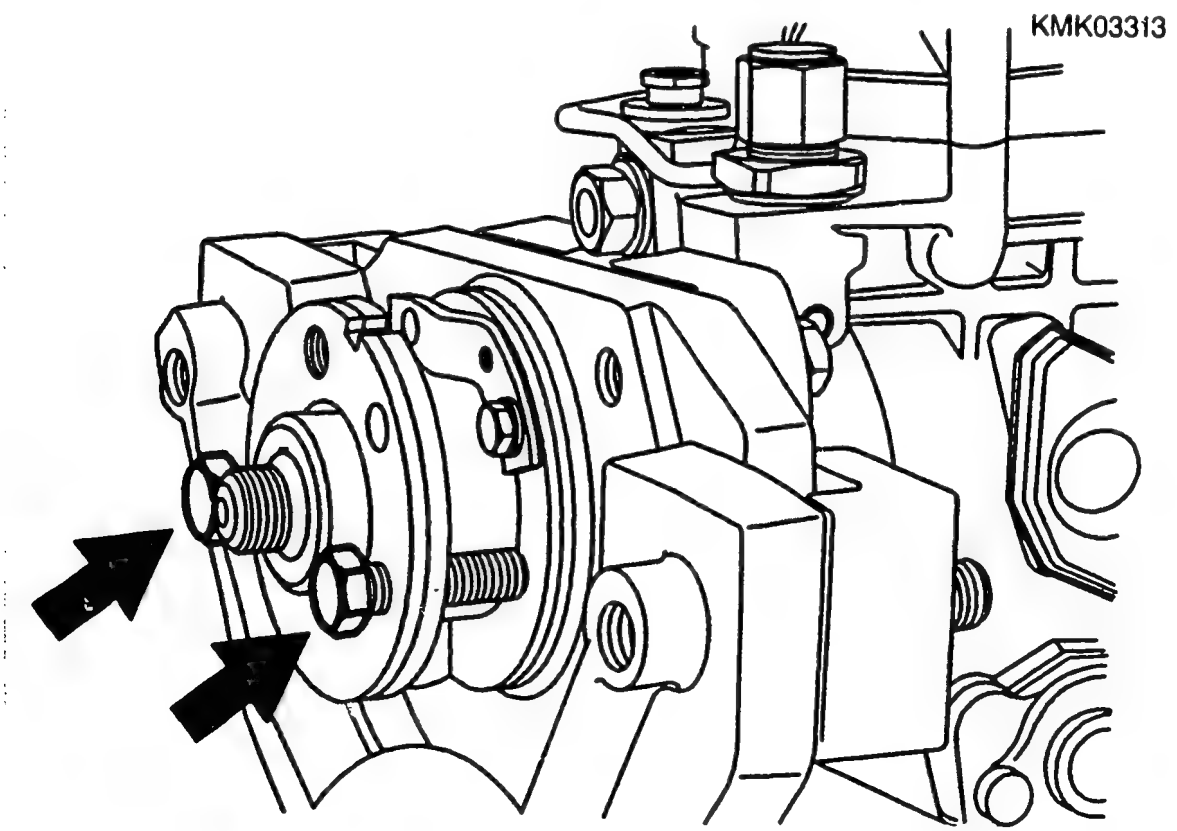

KMK 02256

REMOVING COUPLING HALF
* With release screws

Arrows = Release screws

Screw release screws (M8) into coupling half.
Press coupling half off taper of drive shaft by screwing in the two release screws.
In doing so, pay attention to Woodruff key.

Continue: D09/1 Fig.: D06/2



REMOVING COUPLING HALF
 * With extractor

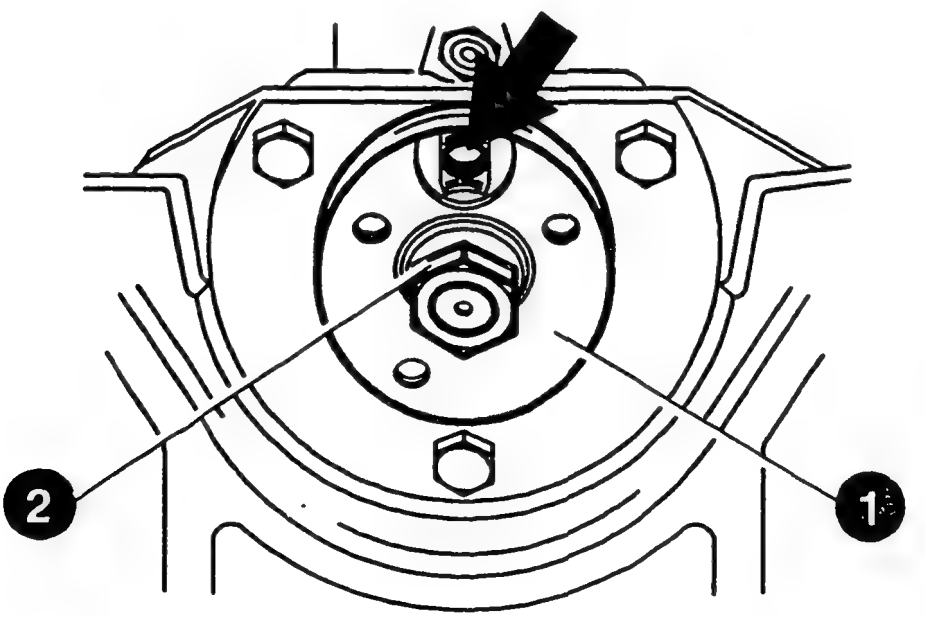
1 = Coupling half
2 = Fastening nut

Loosen fastening nut.

NOTE:
Do not counterhold at setting hole (arrow).
Press off coupling half with commercially available extractor.

Continue: D09/1 Fig.: D07/2

KMK03314



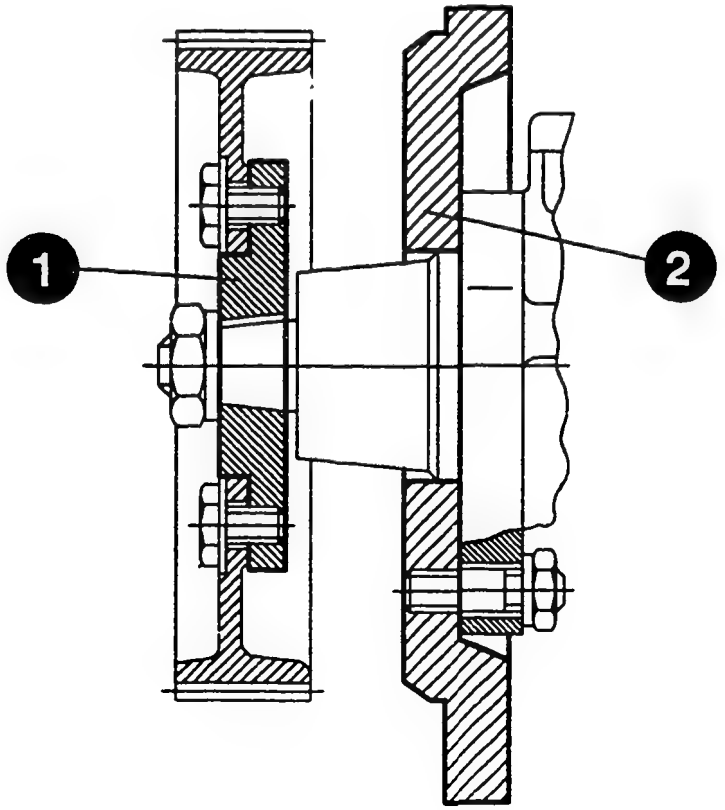
## REMOVING COUPLING FLANGE

1 = Coupling half
2 = Intermediate flange

Note:
Before disassembling distributor-type fuel-injection pumps VE .. R 11, R 14 and VE 15 installed in Ford York Transit, pull off coupling half (with commercially available extractor) and remove intermediate flange.

Continue: D09/1 Fig.: D08/2

KMK03315

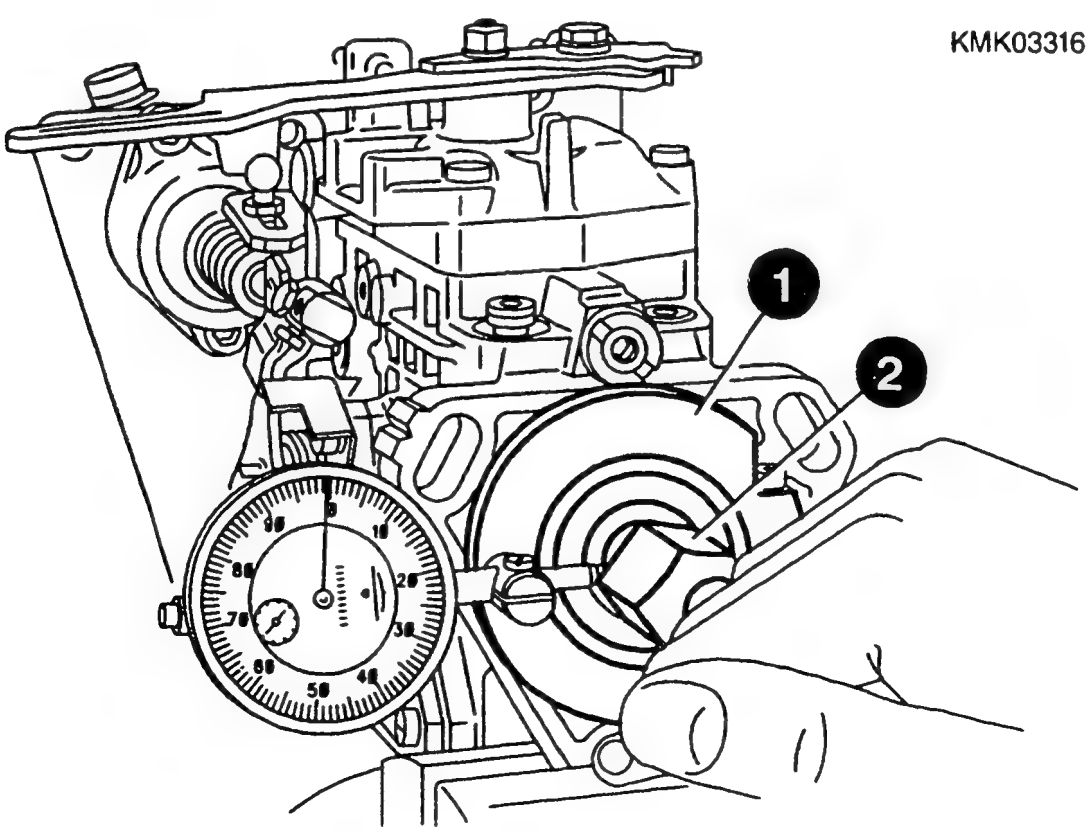


## CHECKING TILT CLEARANCE

1 = Dial-indicator holder
2 = Measuring device

Whenever distributor-type fuel-injection pumps with toothed-belt drive are to be disassembled and repaired, the tilt clearance of the drive shaft must first be measured, so as to avoid unnecessary operations. Attach dial-indicator holder KDEP 1128 or KDEP 1146 with dial indicator 1 687 233 011 to centering collar of pump flange. Screw measuring device KDEP 2890 onto drive shaft.

Continue: D10/1 Fig.: D09/2

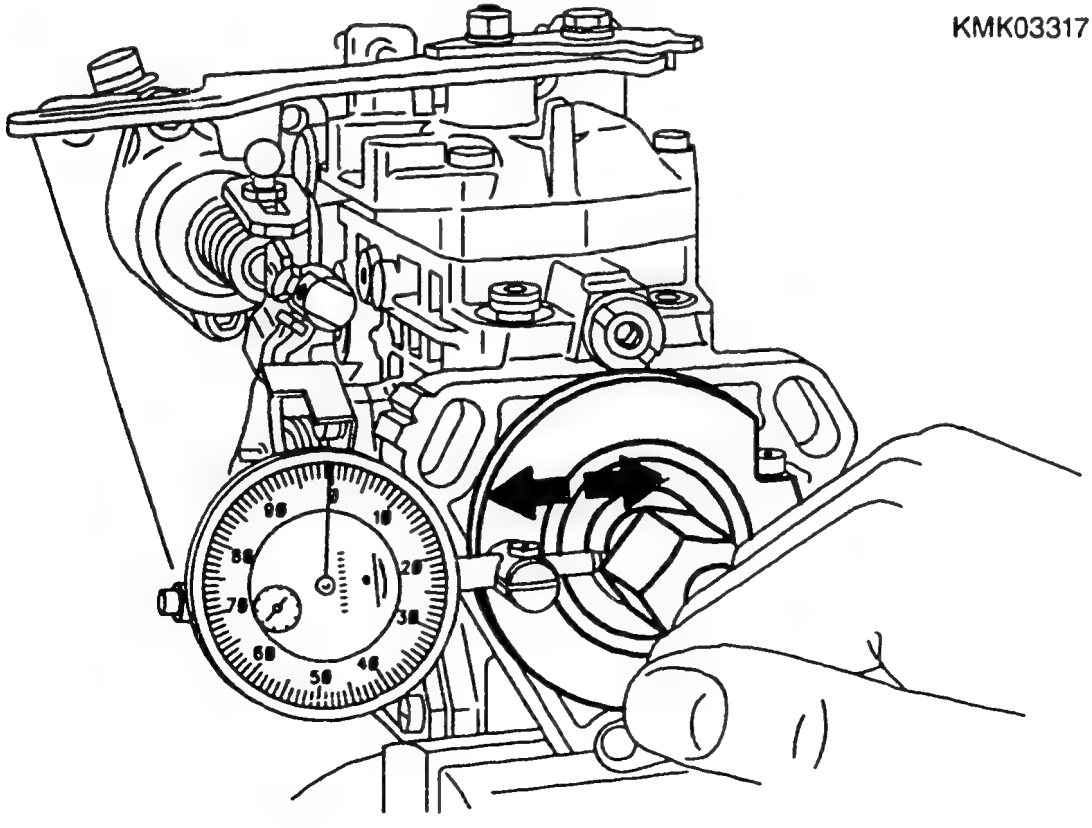


## CHECKING TILT CLEARANCE

Initially tension indicator approx. 2 mm.
Move drive shaft of pump back and forth by hand at threaded pin in direction of resultant tensile force of toothed belt (arrows).

Continue: D11/1 Fig.: D10/2

KMK03317

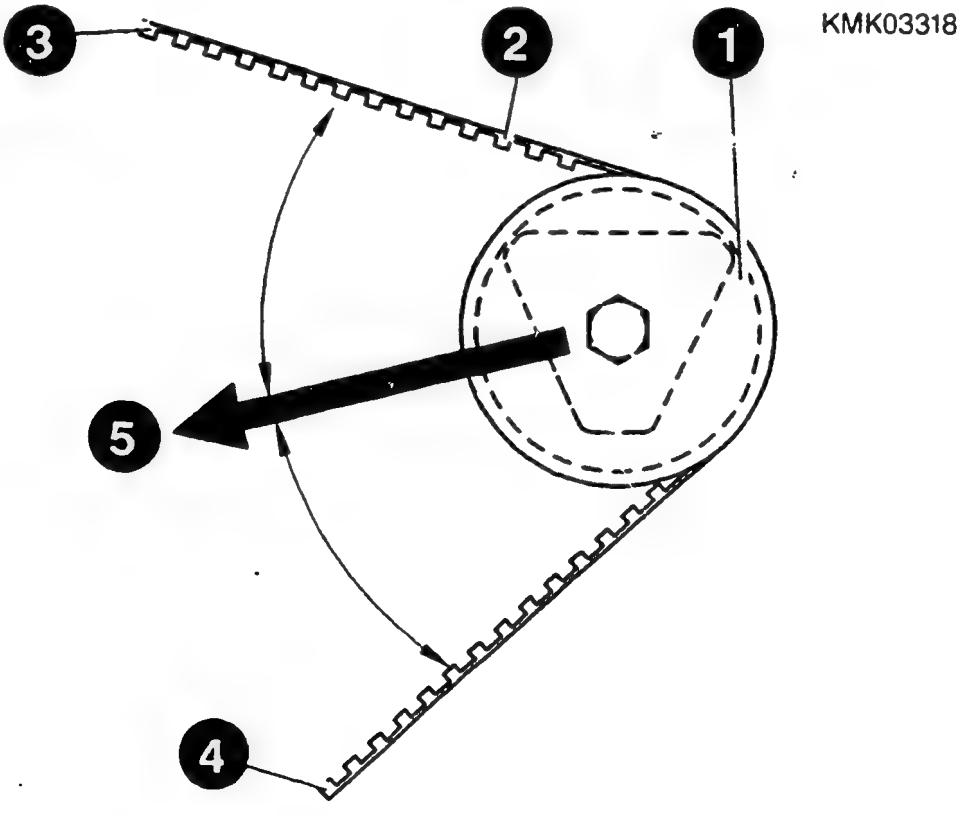


## CHECKING TILT CLEARANCE

1 = Distributor-type fuel-injection pump driving gear
2 = Toothed belt
3 = Toothed-belt arm 1
4 = Toothed-belt arm 2
5 = Direction of resultant toothed-belt force

The direction of the resultant tensile force results from the position of the two toothed-belt arms with respect to the pump driving gear at the motor. This position is to be established prior to pump removal.

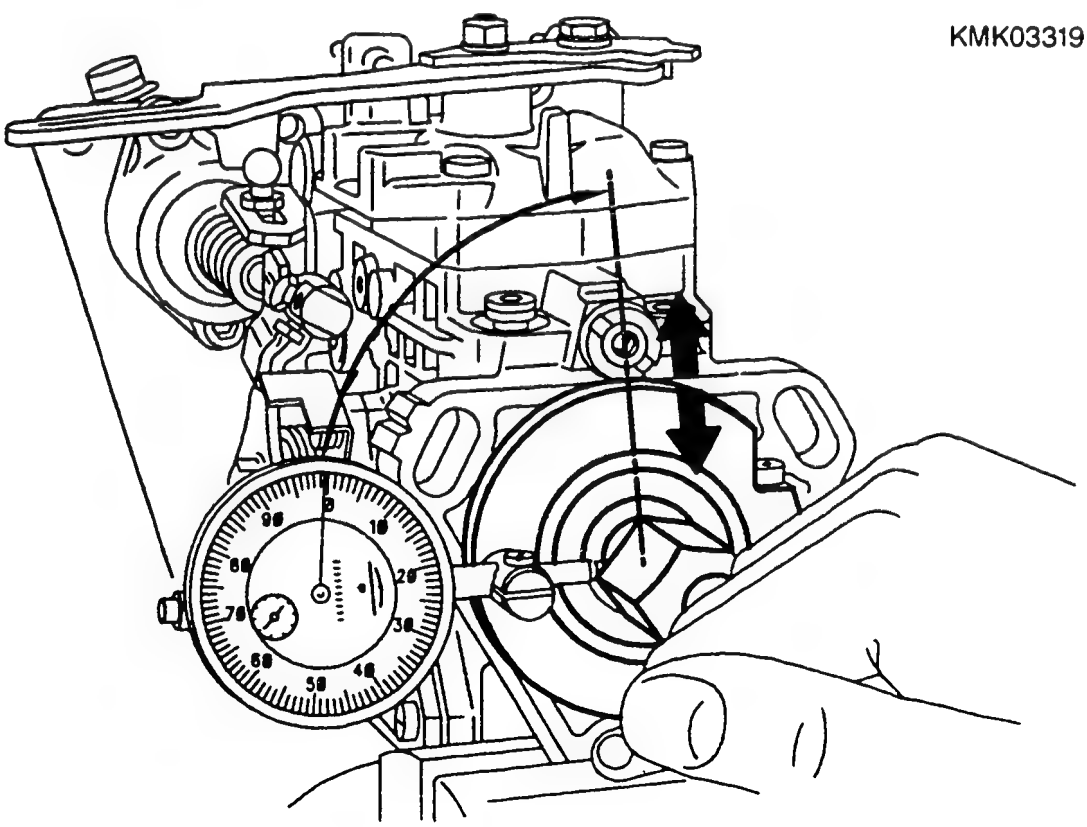
Continue: D12/1 Fig.: D11/2



## CHECKING TILT CLEARANCE

Slightly loosen clamping screw at dial-indicator holder following first measurement procedure. Turn dial-indicator holder with dial indicator through 90° to first measurement plane. Tighten clamping screw again. Perform second tilt-clearance measurement in this measurement plane. The tilt clearance must not exceed max. 0.25 mm in both measurement planes.

Continue: D13/1 Fig.: D12/2



## CHECKING TILT CLEARANCE

In the case of direct-drive distributor-type fuel-injection pumps (not by way of toothed belt), both measurement planes are positioned horizontally and perpendicularly with respect to the pump housing. Here again the maximum tilt-clearance tolerance is 0.25 mm.

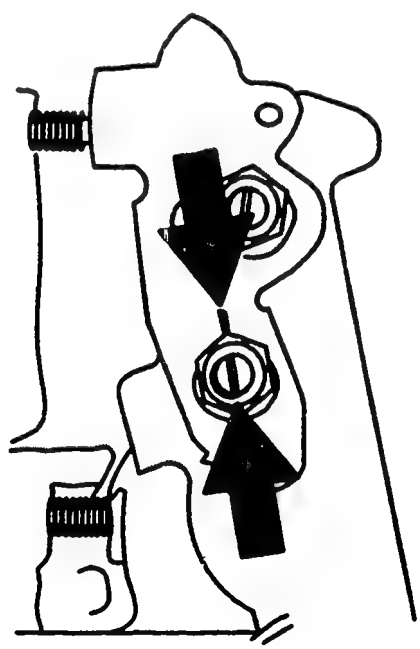
If the stated tolerance or the tilt clearance is exceeded, use is to be made of a new housing (and if applicable also a new drive shaft).

Continue: D14/1

## REMOVING HOUSING COVER

Remove overflow restriction and empty distributor-type fuel-injection pump.
Attach distributor-type fuel-injection pump with flange and support clamp KDEP 2963 to clamping support KDEP 2919.
Mark control lever and setting shaft with respect to one another (arrows).

Continue: D15/1 Fig.: D14/2



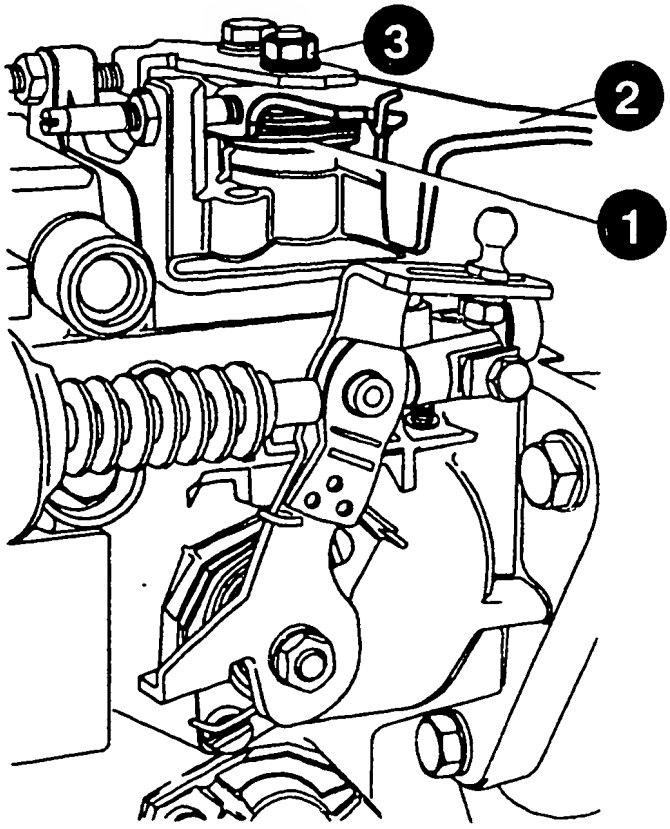
KMK02289

REMOVING HOUSING COVER

1 = Cylindrical helical coiled spring
2 = Control lever
3 = Hexagon nut with spring lock washer

Disengage cylindrical helical coiled spring.
Remove hexagon nut with spring lock washer.
Pull off control lever.
Remove fastening screws of housing cover.

Continue: D16/1 Fig.: D15/2



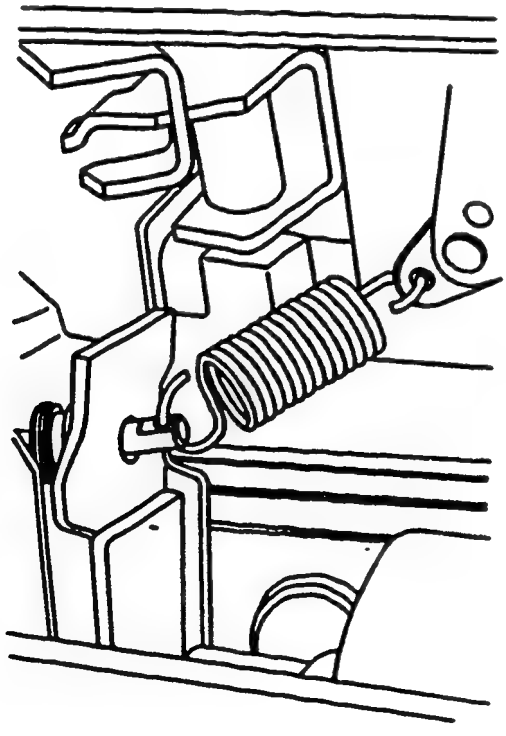

KMK03294

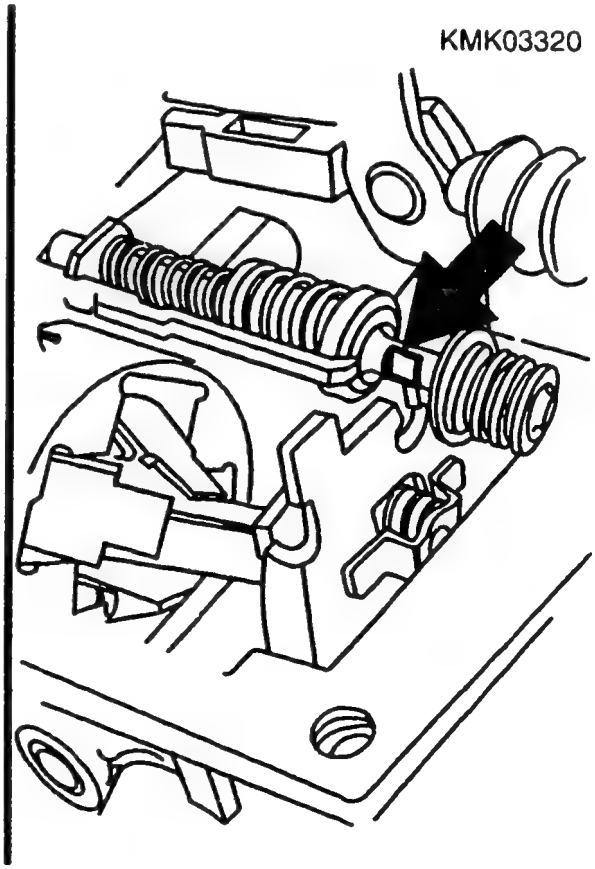
## REMOVING HOUSING COVER

Select further procedure in line with following features:

* Pump with variable-speed governor, left picture — D17/1
* Pump with part-load governor, right picture — D19/1
* Pump with housing-fixed idle spring (LFG) (not illustrated) — D23/1

Continue: D17/1 Fig.: D16/2





REMOVING HOUSING COVER
* Variable-speed governor removal

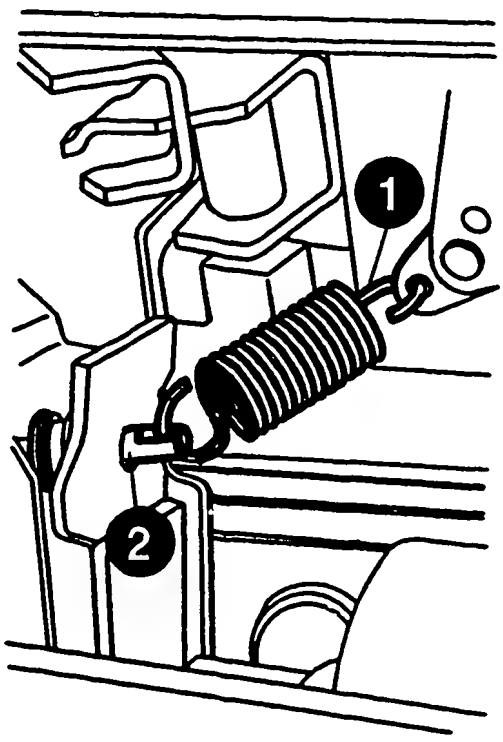
1 = Extension spring
2 = Retaining pin with compression spring

Raise housing cover and disengage extension spring from retaining pin.

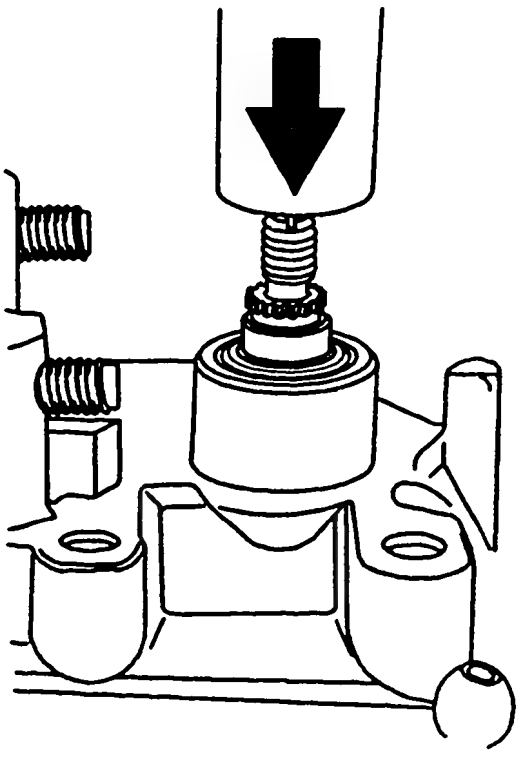
Set down retaining pin with compression springs. Disengage extension spring from setting shaft.

Press through setting shaft in direction of inside of cover.

Continue: D18/1 Fig.: D17/2




KMK03295



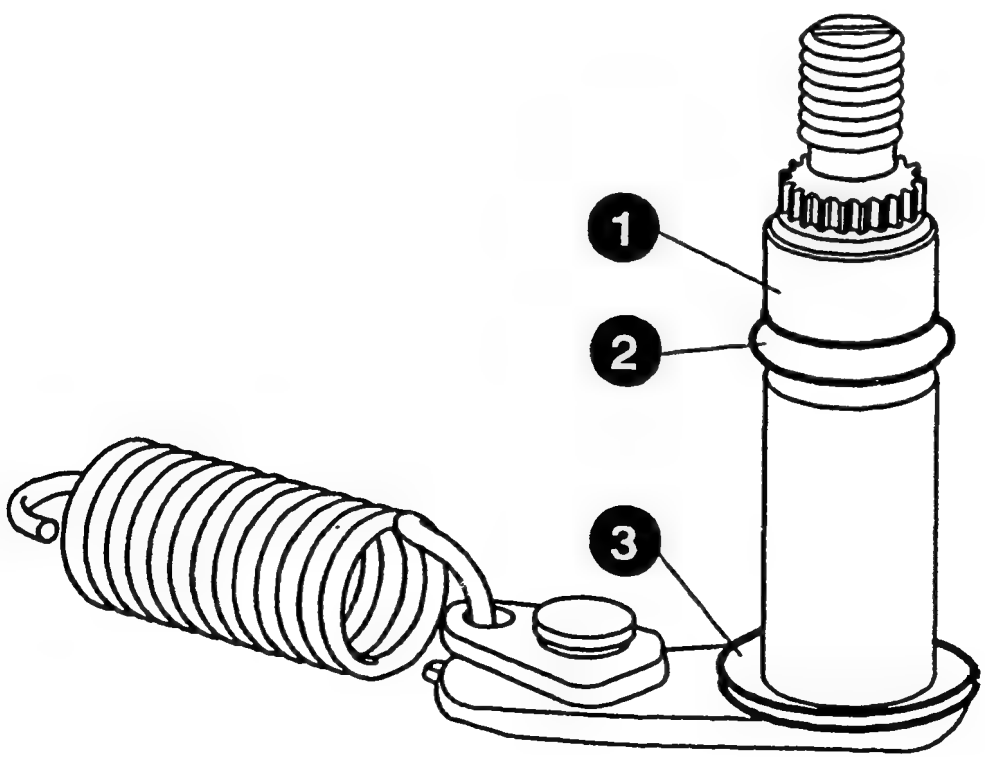
REMOVING HOUSING COVER
 * Variable-speed governor removal

1 = Setting shaft
2 = O-ring
3 = Washer

Remove O-ring and shim from setting shaft.
Remove housing cover. Take seal ring out of housing cover.

Continue: D24/1 Fig.: D18/2

KMK03296

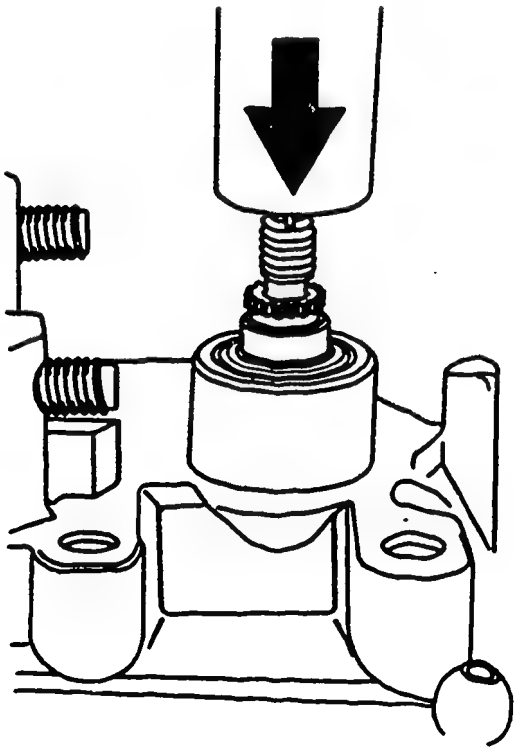


REMOVING HOUSING COVER

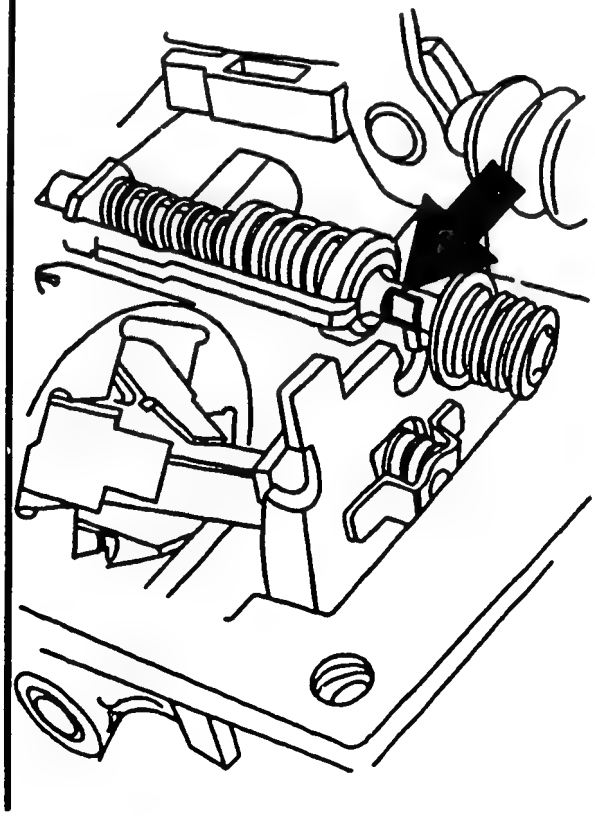
* Remove part-load governor with detachment surfaces
* Without detachment surfaces, Coordinate D21/1

Press through setting shaft in direction of inside of cover.
Raise housing cover.
Push part-load governor in direction of fulcrum lever and disengage from fulcrum lever at milled surfaces (arrow). Remove entire part-load governor. Remove O-ring and shim from setting shaft.

Continue: D20/1 Fig.: D19/2



KMK03321



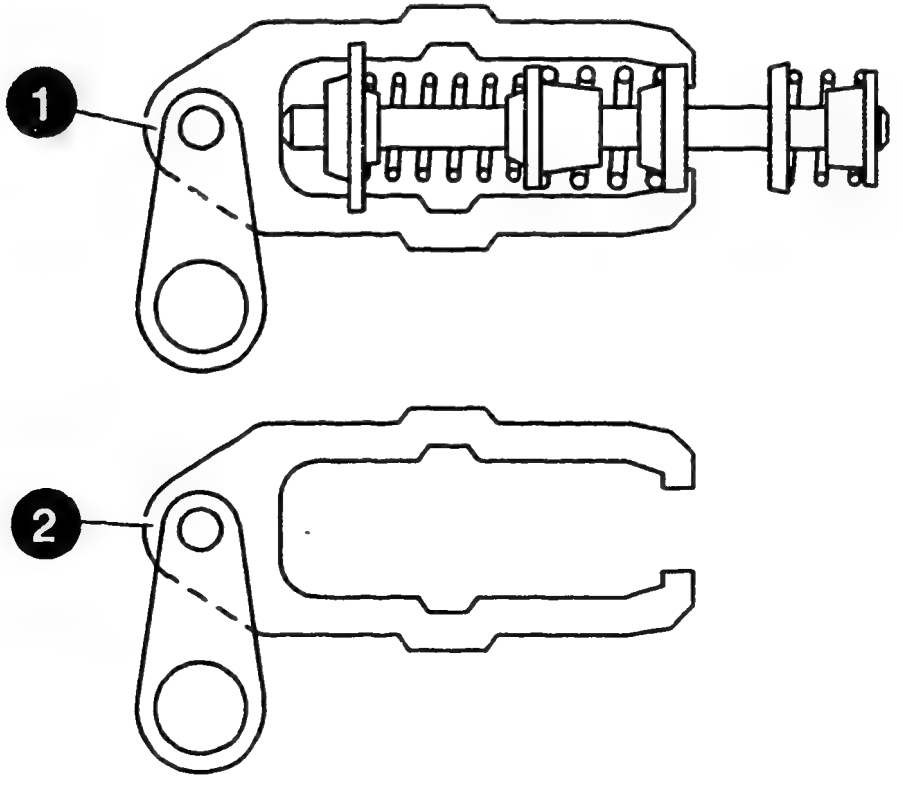
REMOVING HOUSING COVER
* Remove part-load governor with detachment surfaces

1 = Part-load governor, complete
2 = Setting shaft with clamp

Note:
The part-load governor can either be ordered complete or without spring pack if only the setting shaft is worn.

Continue: D24/1 Fig.: D20/2

KMK03322

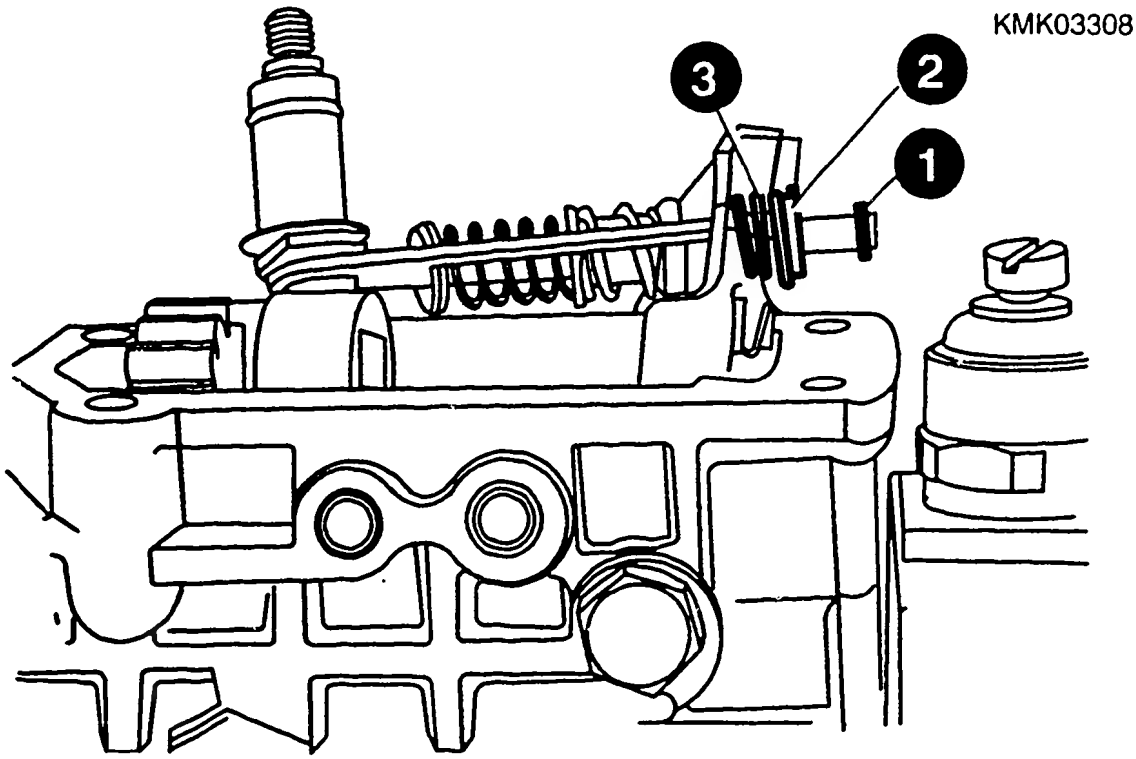


REMOVING HOUSING COVER
* Removing part-load governor with no detachment surfaces

1 = Retaining ring
2 = Retaining pin
3 = Intermediate spring

Press through setting shaft in direction of inside of cover.
Lift housing cover.
Remove retaining ring from guide pin of part-load governor.
Remove retaining pin and intermediate spring.

Continue: D22/1 Fig.: D21/2

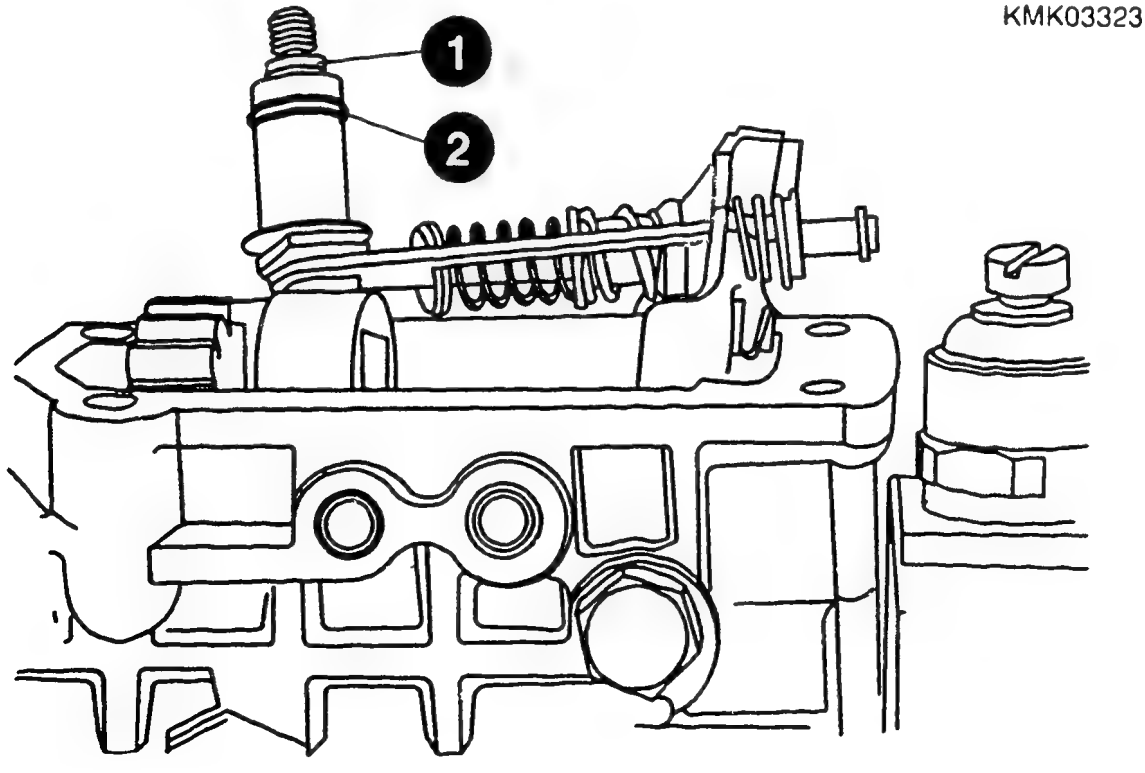


REMOVING HOUSING COVER
* Removing part-load governor with no detachment surfaces

1 = Setting shaft
2 = O-ring

Remove part-load governor complete with setting shaft, main governor spring and part-load spring from fulcrum lever assembly.
Remove O-ring and shim from setting shaft.
Note:
Shim is on hook of part-load governor.

Continue: D24/1 Fig.: D22/2

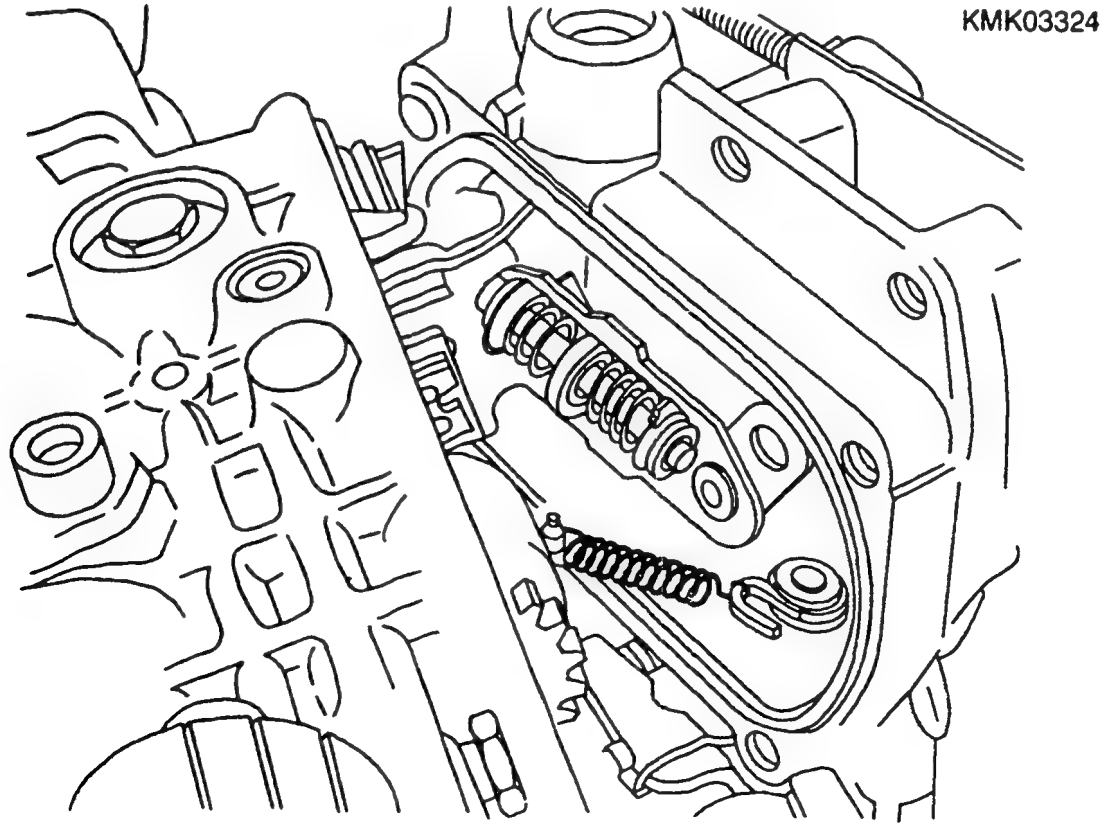


REMOVING HOUSING COVER
* Pump with housing-fixed idle spring (LFG)

1 = Extension spring (idle spring)
2 = Part-load governor

Fold housing cover somewhat to one side and disengage extension spring (idle spring). Do NOT overextend spring.
Press through setting shaft in direction of inside of cover.

Continue: D24/1 Fig.: D23/2



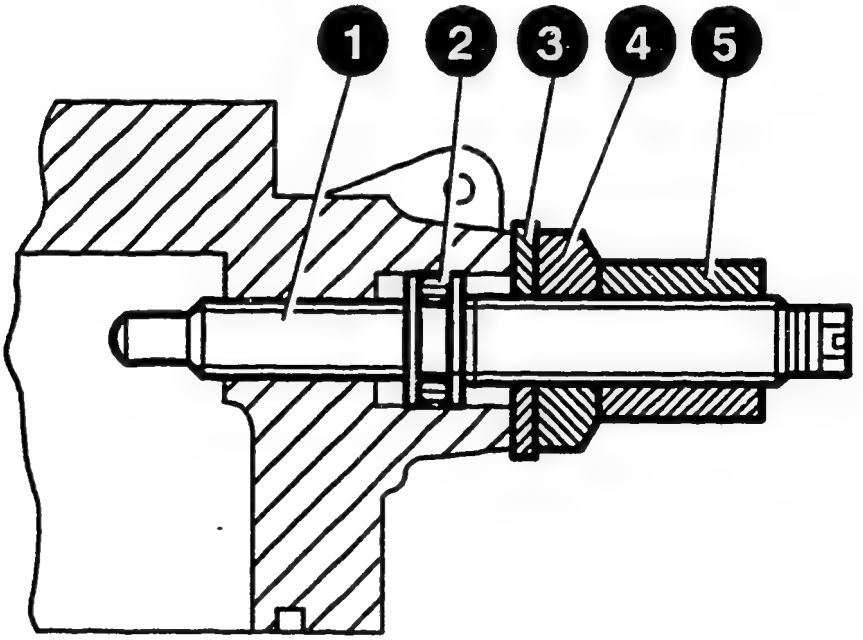
REMOVING THREADED PIN (FULL-LOAD ADJUSTING SCREW)

1 = Threaded pin (full-load adjusting screw)
2 = O-ring
3 = Washer
4 = Hexagon nut
5 = Retaining sleeve

Remove seal ring from housing cover.
Remove threaded pin with hexagon nut, washer, O-ring and retaining sleeve.

Continue: D25/1 Fig.: D24/2

KMK03298



REMOVING SHUTOFF DEVICE

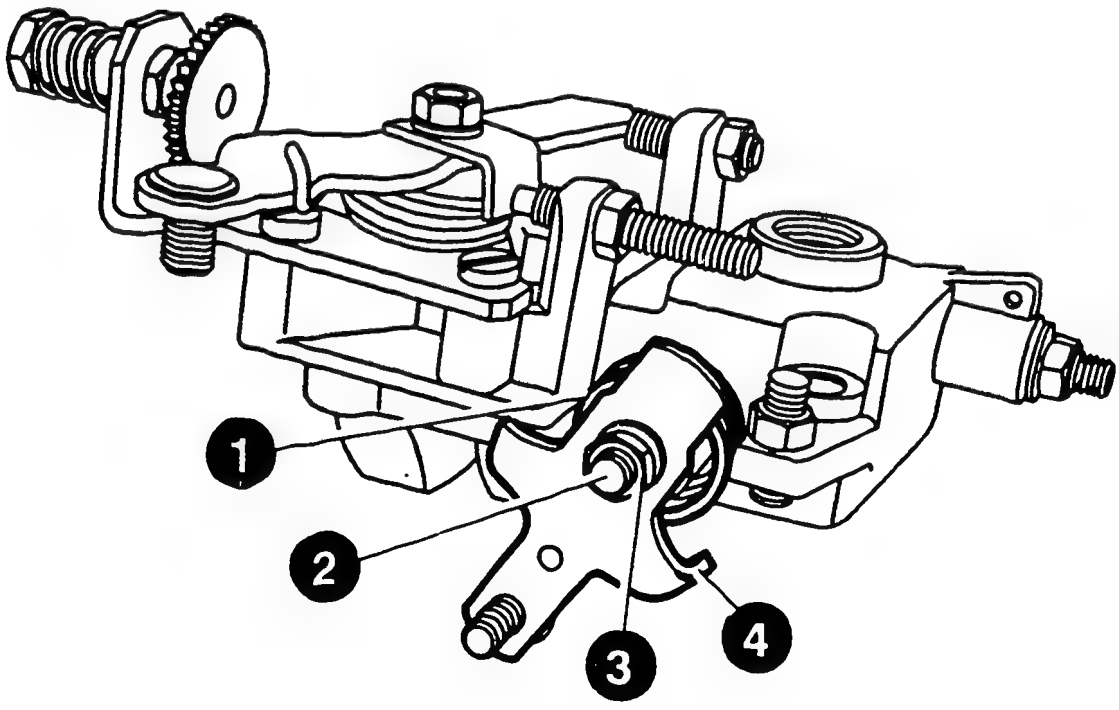
1 = Cylindrical helical coiled spring
2 = Lever shaft
3 = Hexagon nut
4 = Stop lever

* Pump with no shutoff device:
  Continue on Coordinate D27/1

Disassembling mechanical shutoff device:
Disengage cylindrical helical coiled spring.
Mark position of outer stop lever/excess fuel quantity restrictor with respect to lever shaft. Remove hexagon nut and spring lock washer.
Pull outer stop lever off lever shaft.

Continue: D26/1 Fig.: D25/2

KMK03325



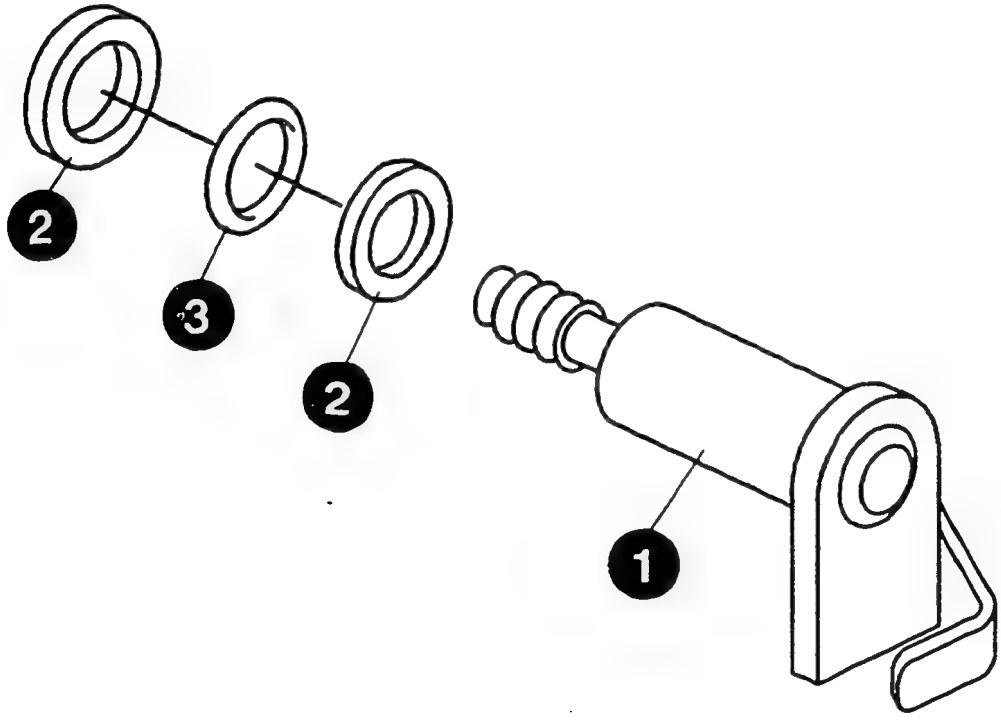
REMOVING SHUTOFF DEVICE

1 = Lever shaft
2 = Shims
3 = O-ring

Pull lever shaft out of housing cover.
Remove shims and O-ring.

Continue: D27/1 Fig.: D26/2

KMK03300

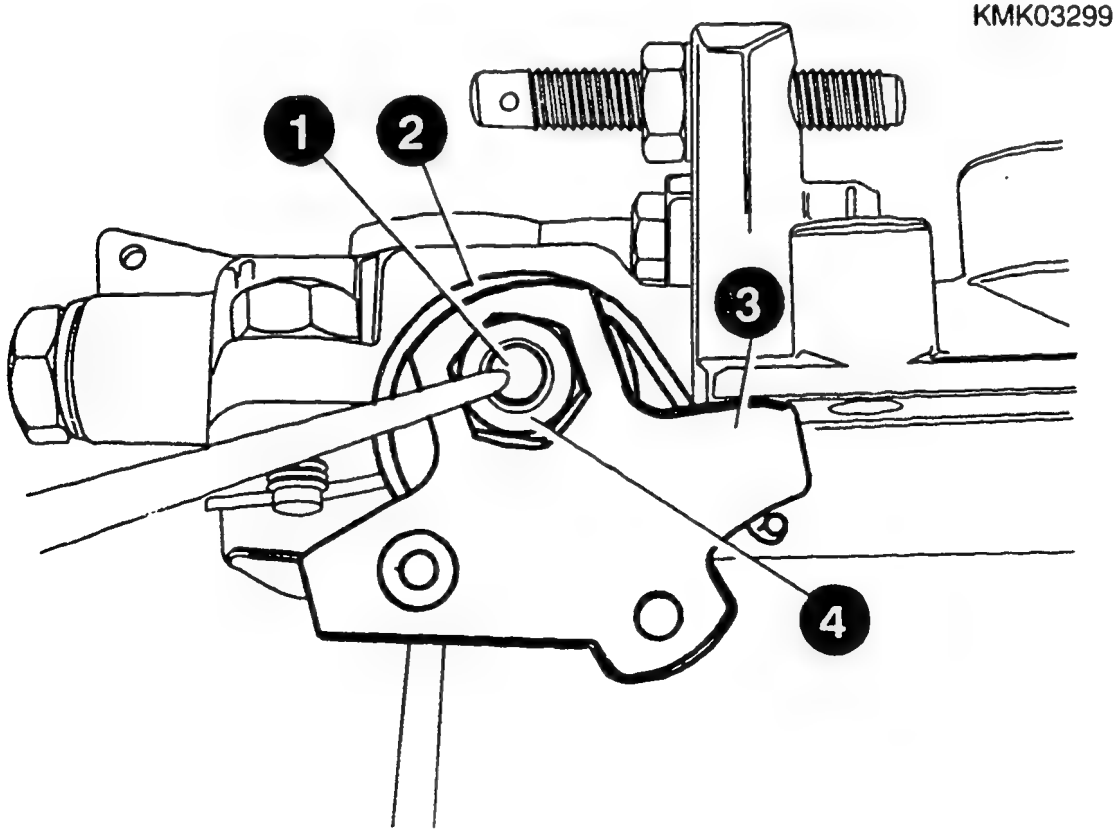


## REMOVING TEMPERATURE-DEPENDENT EXCESS FUEL QUANTITY RESTRICTOR (TAS)

1 = Lever shaft
2 = Cylindrical helical coiled spring
3 = Regulating lever
4 = Hexagon nut

Disengage cylindrical helical coiled spring.
Mark position of regulating lever/stop lever in the case of mechanical stop with respect to lever shaft (see picture).
Remove hexagon nut with spring lock washer.
Pull regulating lever off lever shaft.

Continue: D26/1 Fig.: D27/2



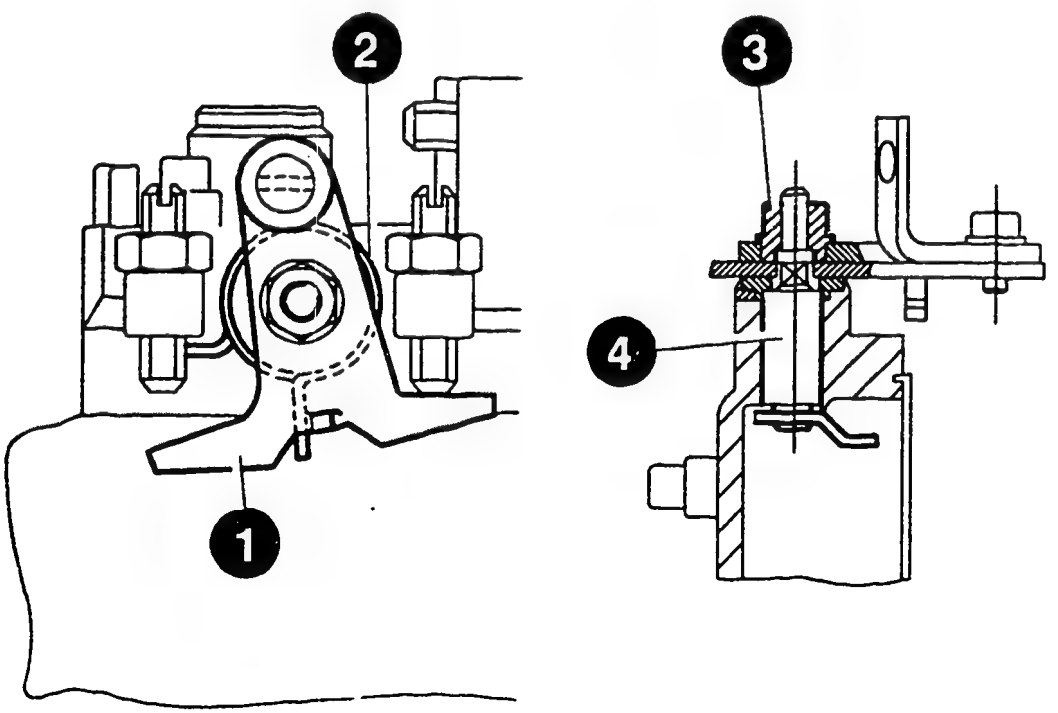
REMOVING SETTING SHAFT, HOUSING-FIXED IDLE SPRING (LFG)

1 = Stop lever
2 = Cylindrical helical coiled spring
3 = Hexagon nut
4 = Lever shaft

Disengage cylindrical helical coiled spring.
Mark position of stop lever with respect to lever shaft.
Remove hexagon nut and stop lever from lever shaft.
Remove setting shaft.

Continue: E01/1 Fig.: D28/2

KMK03326



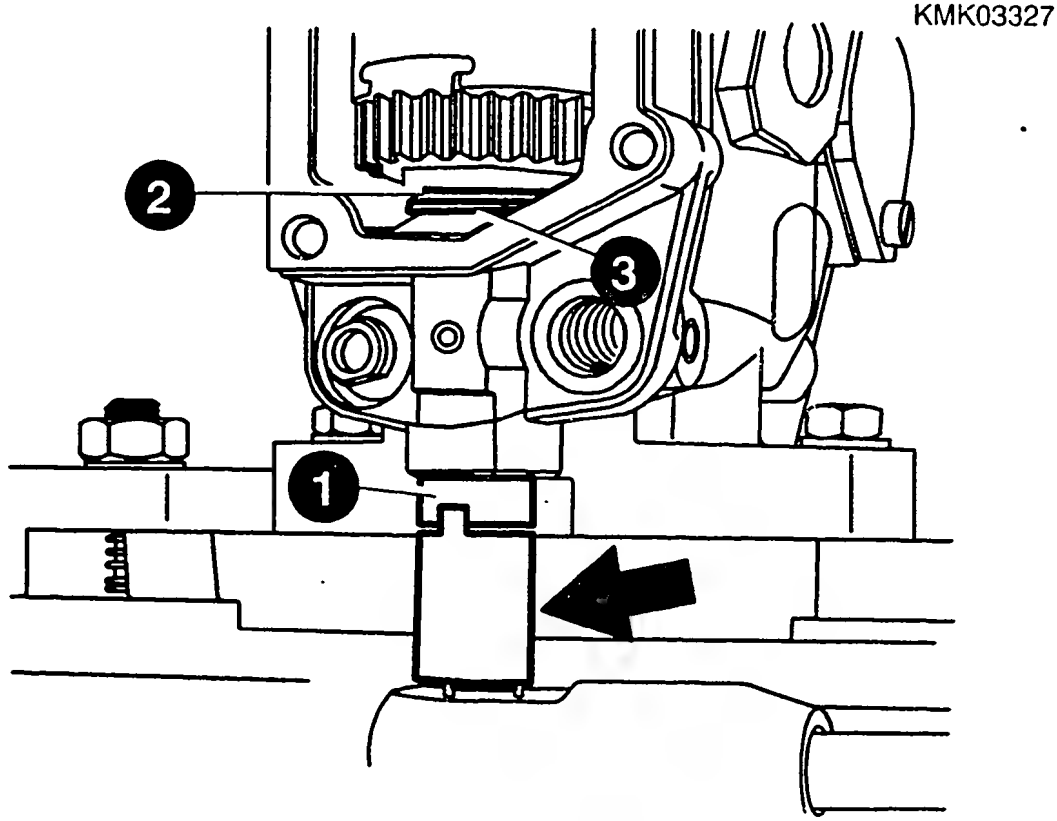
REMOVING GOVERNOR SHAFT

1 = Slotted nut
2 = Supporting plate
3 = Shim plate

Position distributor-type fuel-injection pump perpendicularly.
Loosen slotted nut with adjustment tool KDEP 1082 (arrow).
Governer shaft and slotted nut have left-hand thread in the case of slotted nuts with identification groove around circumference.
Pay attention to supporting plate and trimming plate.

Continue: E02/1 Fig.: E01/2

KMK03327



## REMOVING GOVERNOR SHAFT

Note:
In the case of all clockwise-rotation injection pumps with 50 mm pilot, changes were made to the thread of the governor stem and pump housing (conterclockwise to clockwise) as of FD (date of manufacture) 151. The slotted nut used is replaced by a hexagon nut and washer.

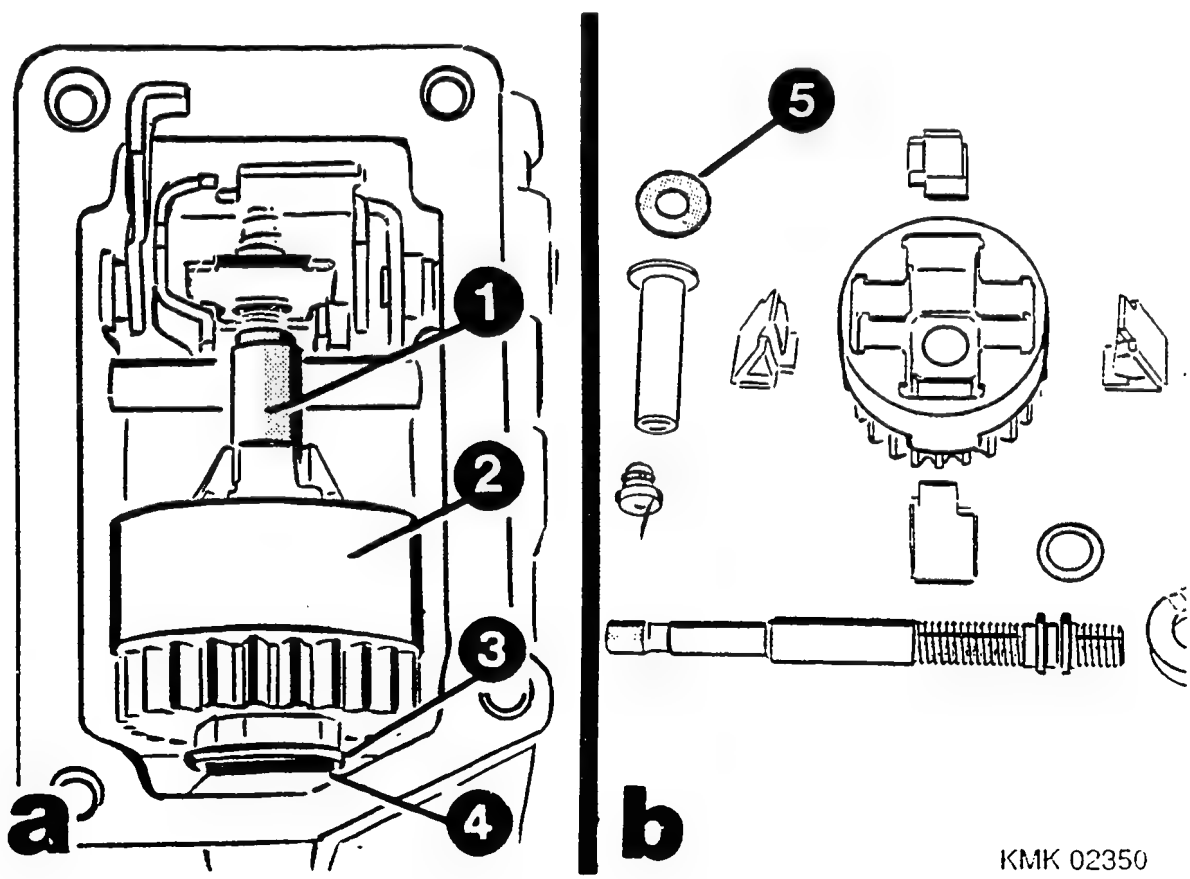
Continue: E03/1

## REMOVING GOVERNOR ASSEMBLY

1 = Sliding sleeve
2 = Governor assembly
3 = Supporting plate
4 = Shim
5 = Spacer

Lift out governor assembly with flyweights and sliding sleeve.
Remove supporting plate and shim.
When disassembling governor assembly, pay particular attention to spacer beneath sliding sleeve (do not lose).

Continue: E04/1 Fig.: E03/2



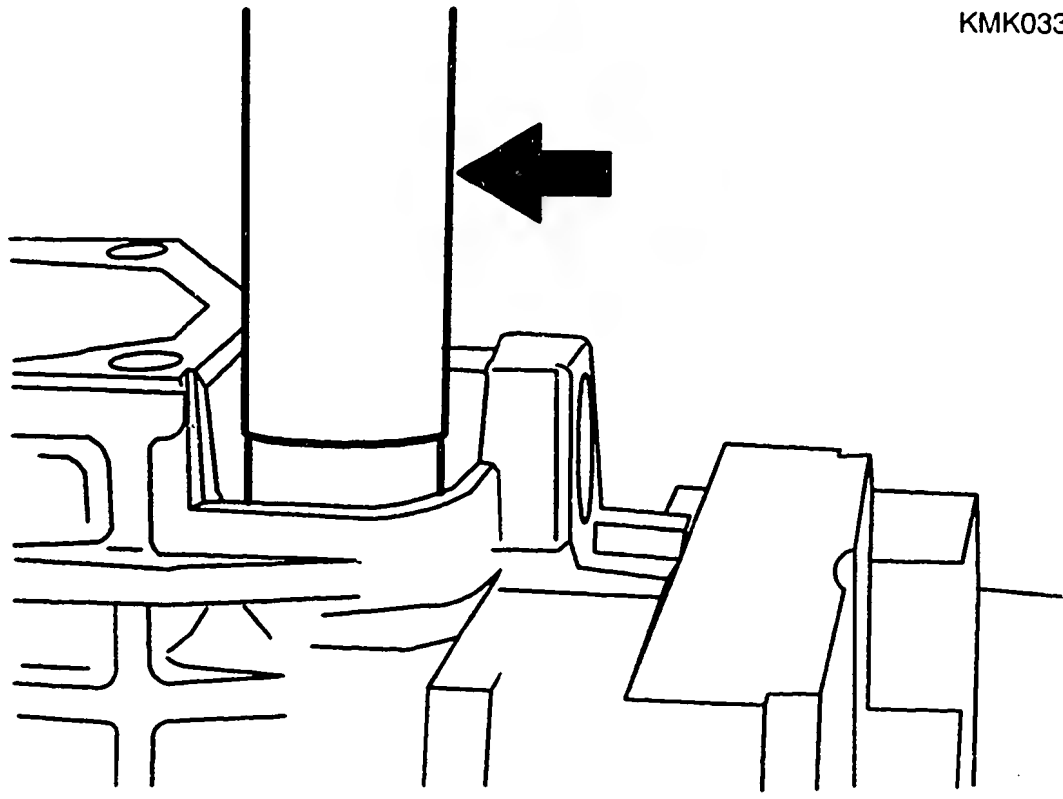
## REMOVING PRESSURE REGULATOR

Screw pressure regulator with socket wrench KDEP 1086 (arrow) out of distributor pump housing and remove O-rings.

Note:
In the case of hydraulic cold-start acceleration device, remove ring main to pressure regulator beforehand.

Continue: E05/1 Fig.: E04/2

KMK03328

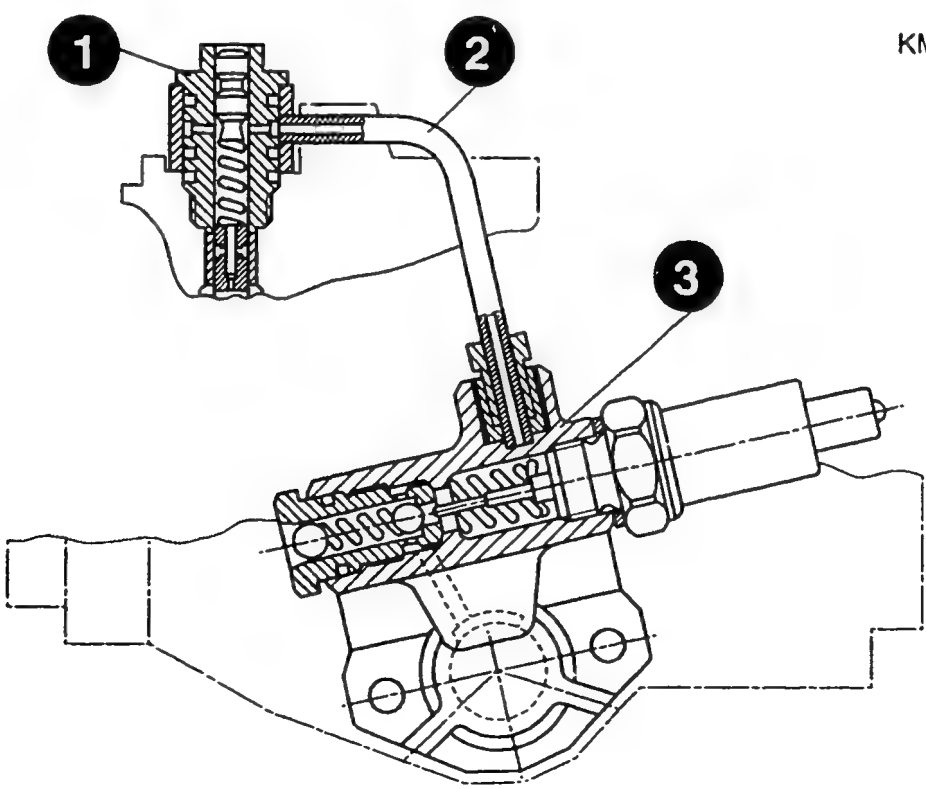


## REMOVING HYDRAULIC COLD-START ACCELERATION DEVICE (KSB)

1 = Pressure regulator
2 = Ring main
3 = KSB control valve

Disassemble ring main from pressure regulator and KSB control valve.
Unscrew KSB control valve.

Continue: E06/1 Fig.: E05/2



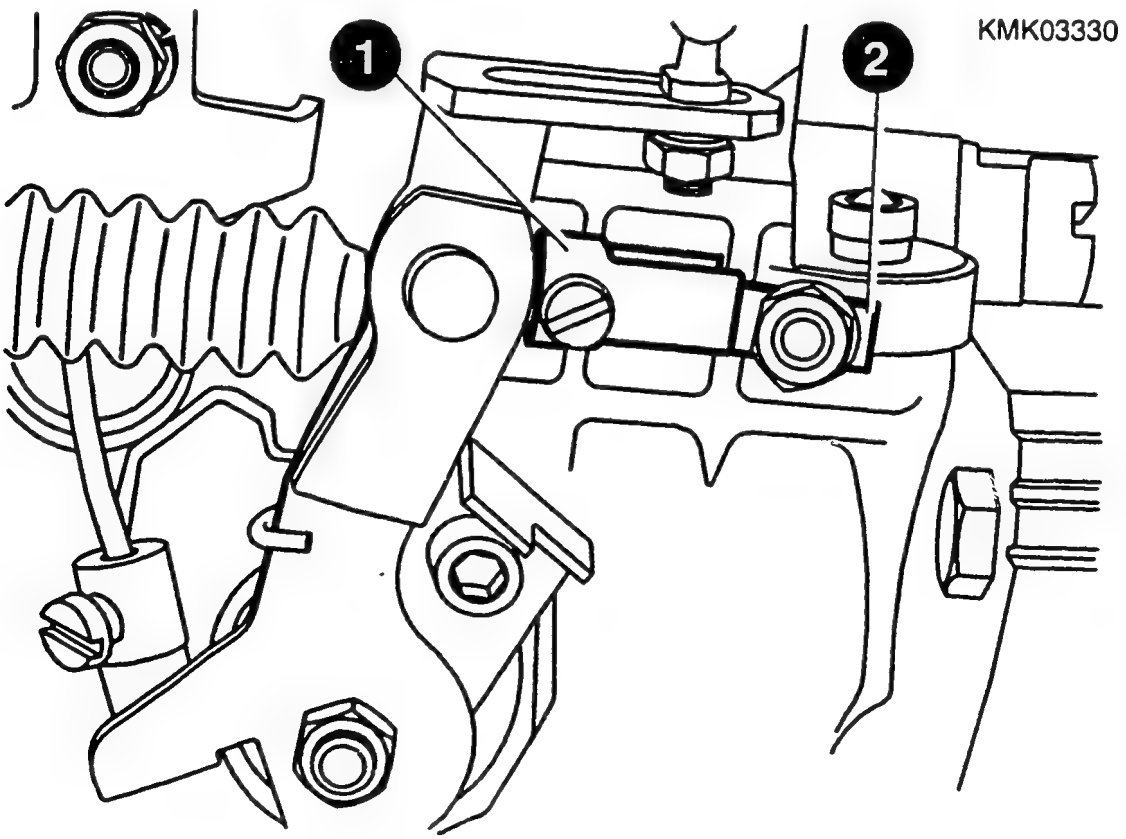

KMK03329

DETACHING CABLE OF TEMPERATURE-CONTROLLED KSB

1 = Intermediate piece
2 = Clamping piece

If applicable, remove intermediate piece and clamping piece at cable between control device and control lever.

Continue: E07/1 Fig.: E06/2



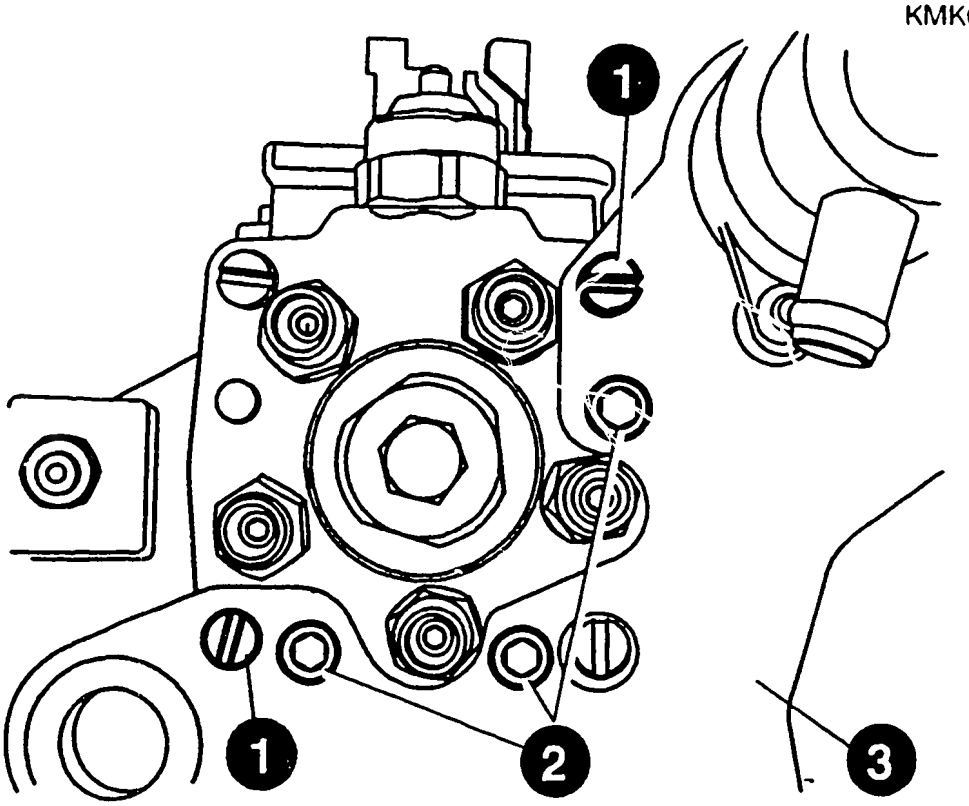
REMOVING SUPPORT PLATE

1 = Fillister-head screws
2 = Hexagon-socket-head cap screws
3 = Support plate

Remove hexagon-socket-head cap screws (three).
Screw out fillister-head screws (two) and remove support plate.
Note:
Loosen and remove T 30 female Torx bolts with commercially available screwdriver insert.

Continue: E08/1 Fig.: E07/2

KMK03331

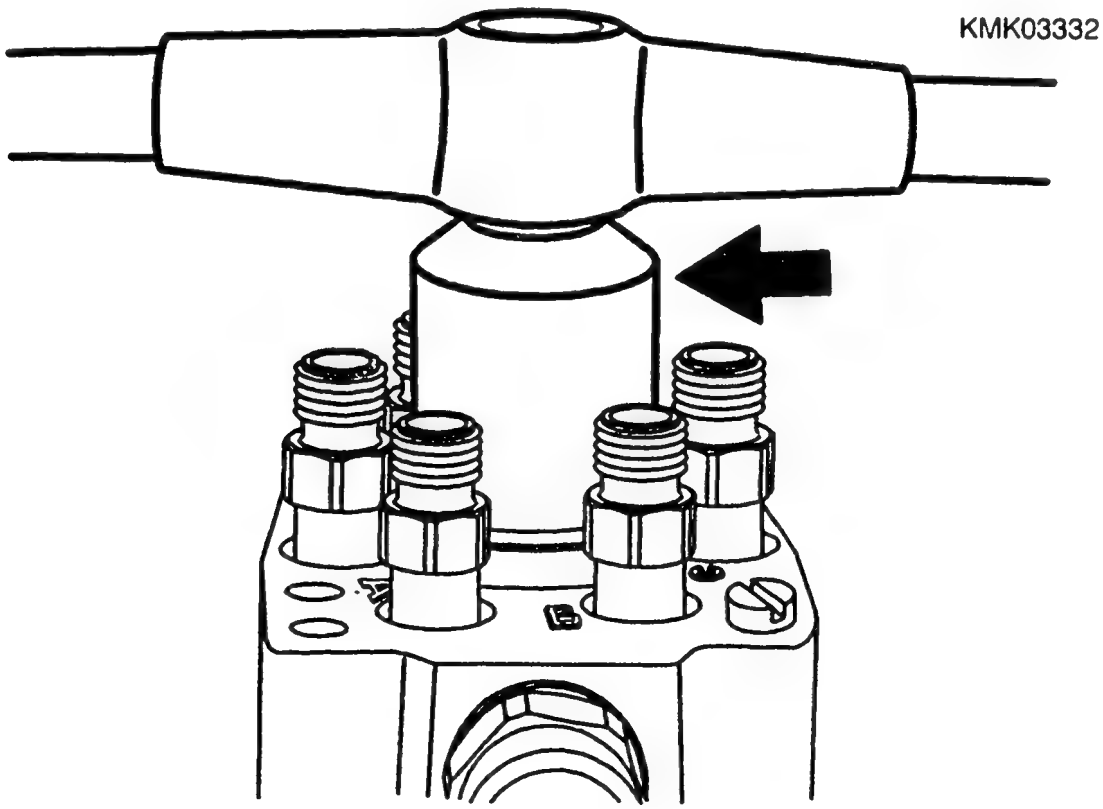


## REMOVING CENTRAL SCREW PLUG AND DELIVERY-VALVE HOLDER

Screw out screw plug with wrench KDEP 1080 (arrow).
Remove seal ring. Remove delivery-valve holder, compression springs, shims and delivery valves.
Remove seal rings with extractor hook KDEP 2938.

Note: The outlets on the distributor head are marked A, B, C etc. (see picture).
Set down delivery-valve holders, compression springs etc. in accordance with the above to ensure that they are re-installed at the same location.

Continue: E09/1 Fig.: E08/2



## REMOVING SHUTOFF SOLENOID

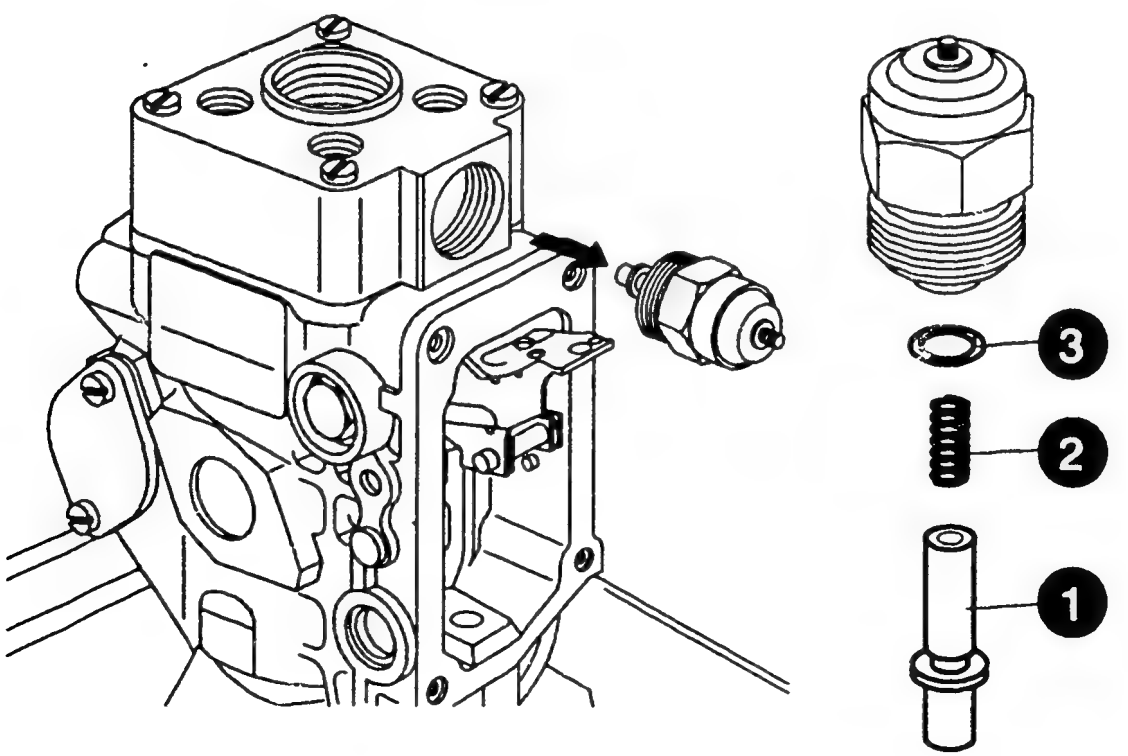
1 = Armature
2 = Spring
3 = O-ring

Loosen and remove shutoff solenoid with box wrench KDEP 1174.

Pay attention to spring and armature.

Continue: E10/1 Fig.: E09/2

KMK03333

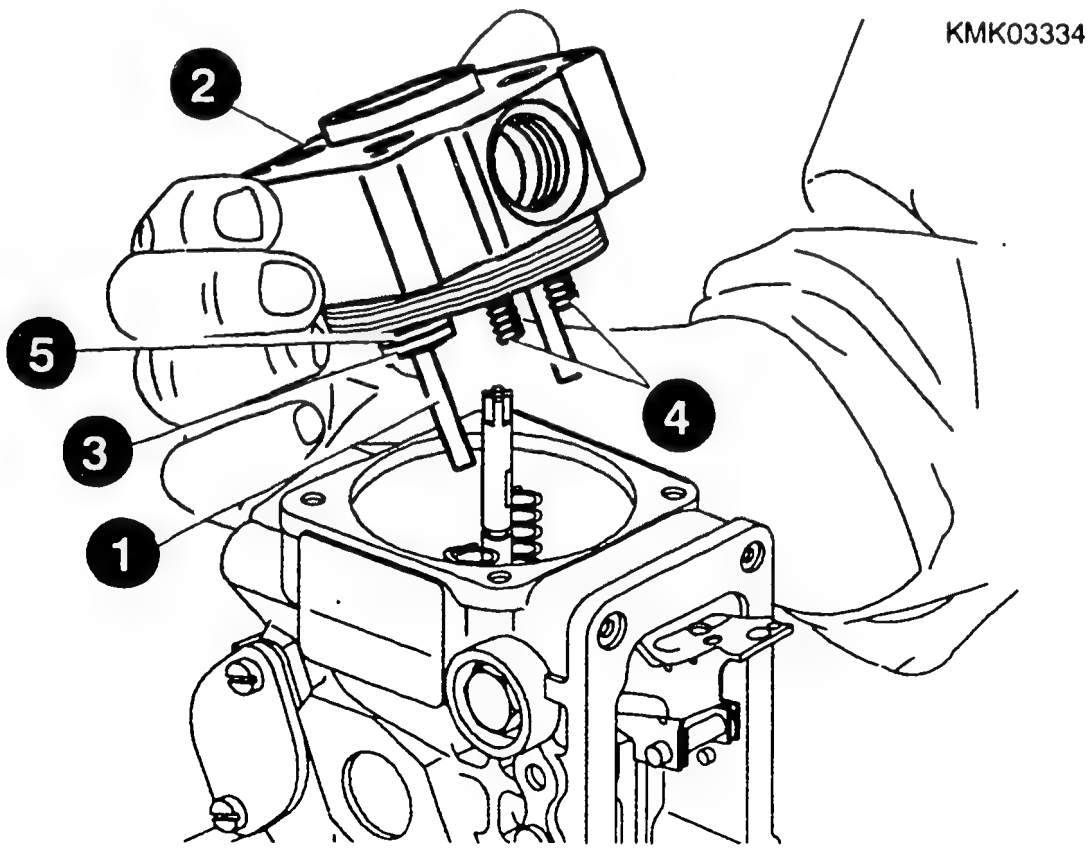


## REMOVING DISTRIBUTOR HEAD

1 = Guide pins
2 = Distributor head
3 = Spring seat
4 = Compression springs
5 = Spacer

Uniformly unscrew fastening screws. Carefully lift off distributor head paying attention to guide pins, spacers and spring seat! Hold compression springs if necessary.

Continue: E11/1 Fig.: E10/2

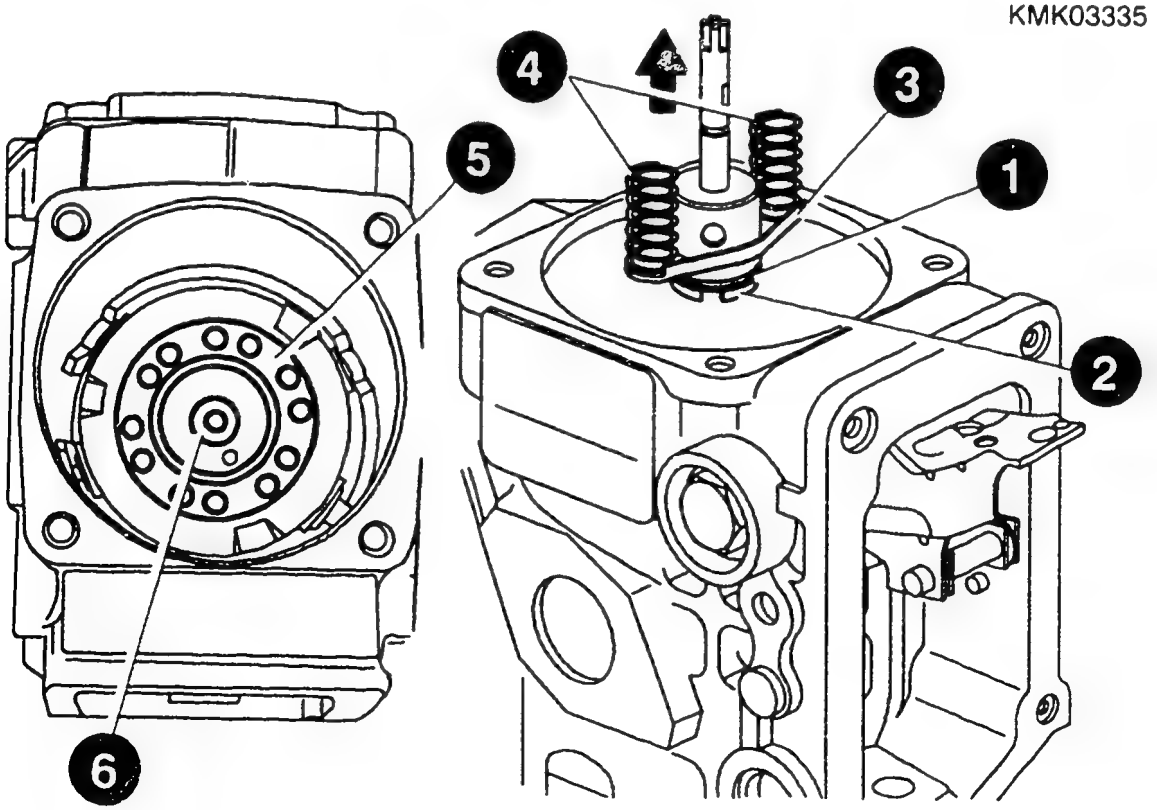


## REMOVING DISTRIBUTOR HEAD

1 = Shim (large)
2 = Slotted washer
3 = Spring seat
4 = Compression springs
5 = Cam plate
6 = Shim (small)

Lift out distributor-pump plunger with control spool, shim (large), slotted washer, spring seat and compression springs (picture, left).
Remove cam plate with shim (small) beneath bottom of plunger (picture, right).

Continue: E12/1 Fig.: E11/2

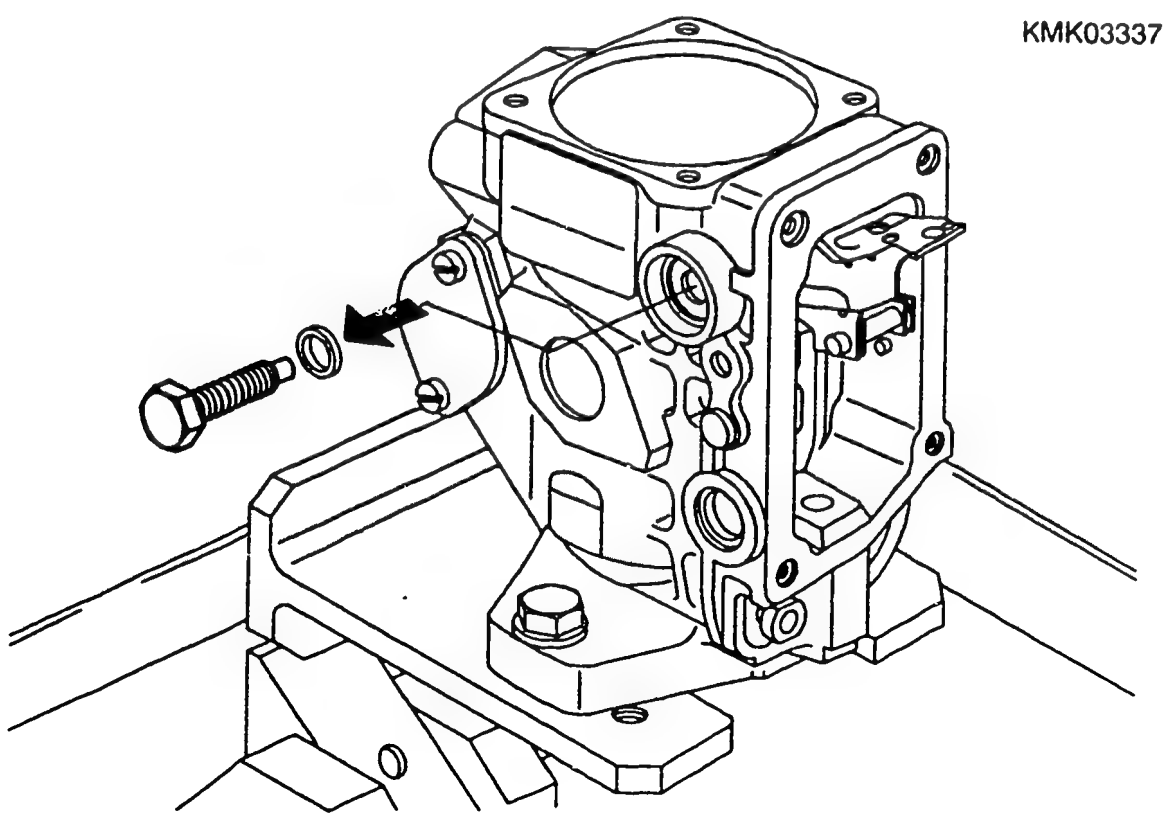


## REMOVING FULCRUM LEVER ASSEMBLY

Loosen and remove side triangle-head bolts with KDEP 1087.

Remove fulcrum lever assembly made up of starting lever, tensioning lever and correction lever.

Continue: E13/1 Fig.: E12/2



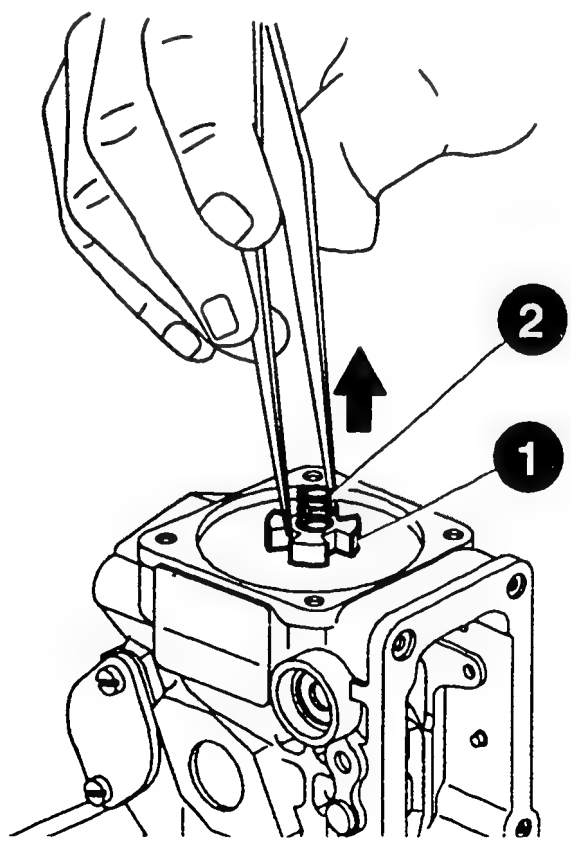
## REMOVING SLOTTED WASHER

1 = Slotted washer
2 = Compression spring

Remove slotted washer together with compression spring.
Make sure that compression spring is not lost.

Continue: E14/1 Fig.: E13/2

KMK03338

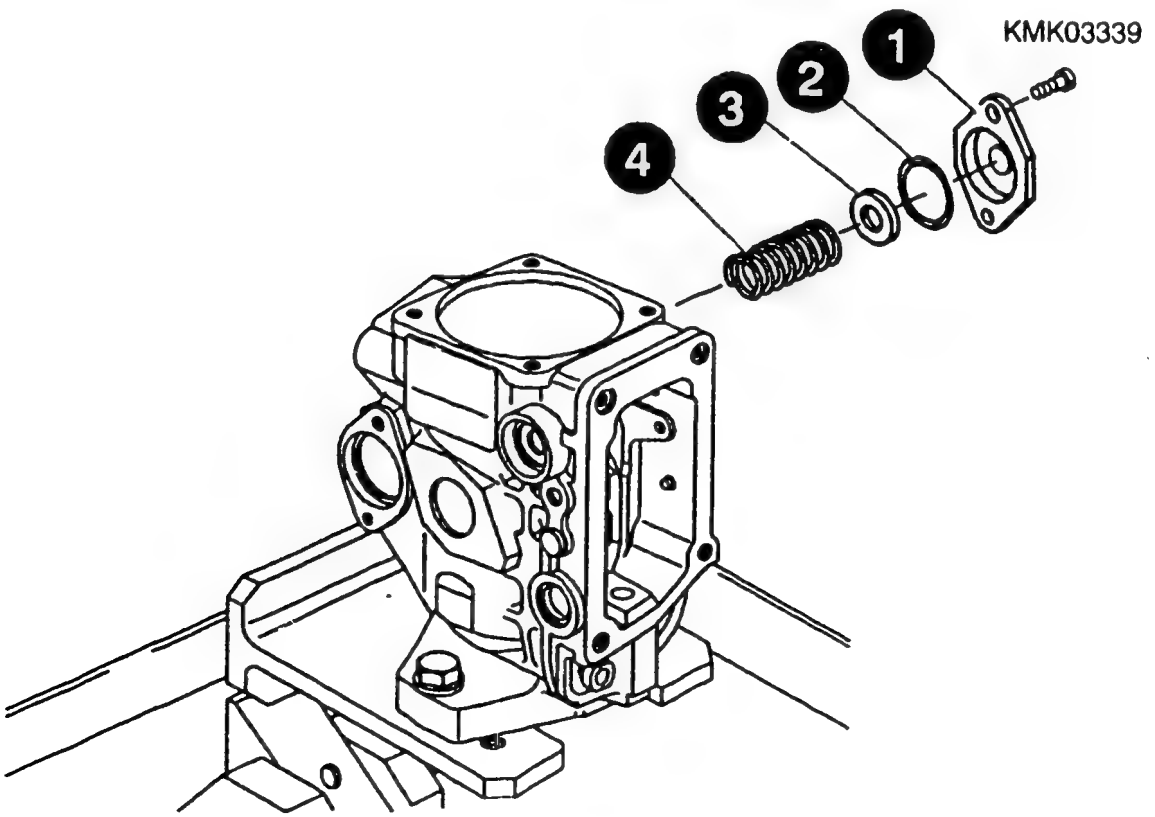


## DISASSEMBLING TIMING DEVICE

1 = Closing cover
2 = Seal ring
3 = Shim
4 = Compression spring

Unscrew closing cover (spring side) with shims.
Remove seal ring; remove compression spring and shim from timing-device piston (not visible in picture).

Continue: E15/1 Fig.: E14/2



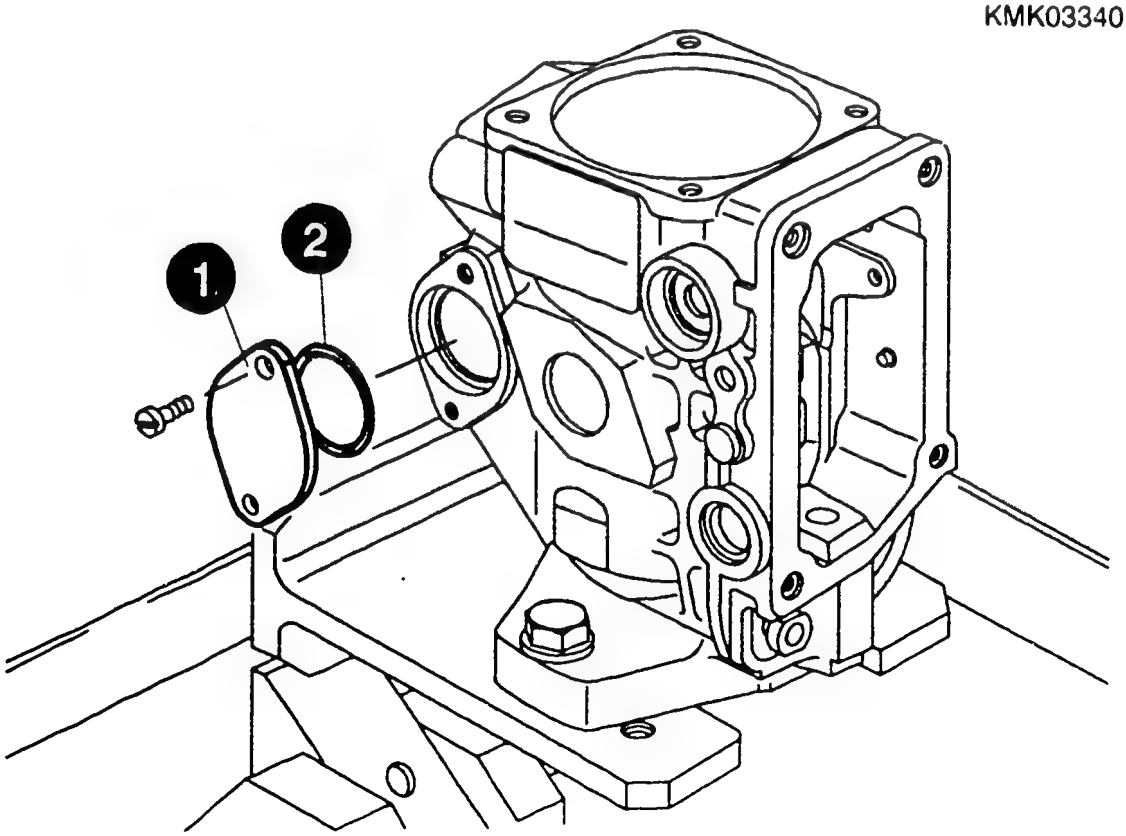
## DISASSEMBLING TIMING DEVICE

1 = Seal ring
2 = Cover plate

Unscrew cover plate and remove seal ring.

Continue: E16/1 Fig.: E15/2

KMK03340



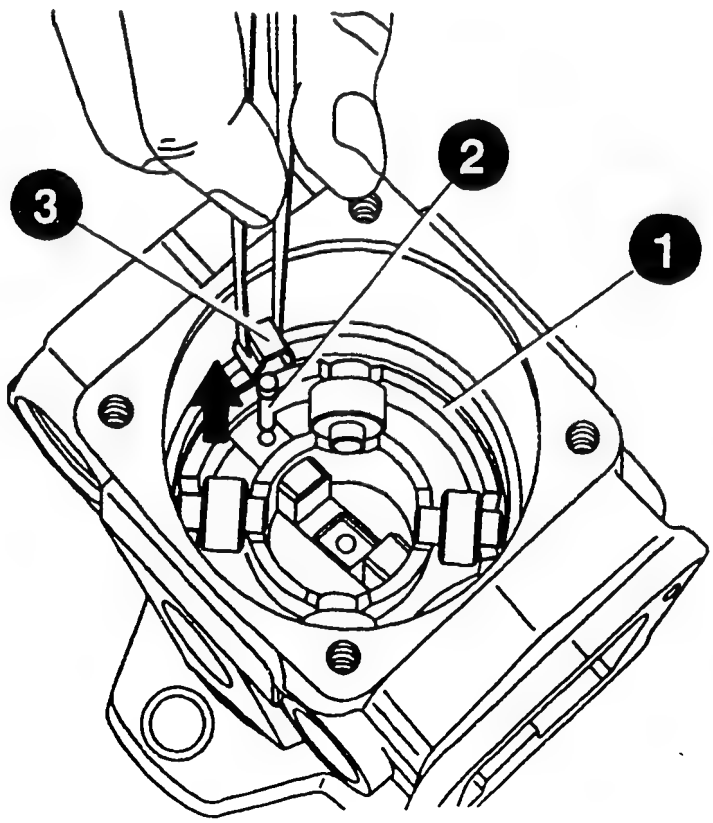
## REMOVING CAM ROLLER RING AND TIMING-DEVICE PISTON

1 = Cam roller ring
2 = Retaining pin
3 = Retaining bracket

Pull off retaining bracket.
Pull out retaining pin with pointed pliers.

Continue: E17/1 Fig.: E16/2

KMK03341



## REMOVING CAM ROLLER RING AND TIMING-DEVICE PISTON

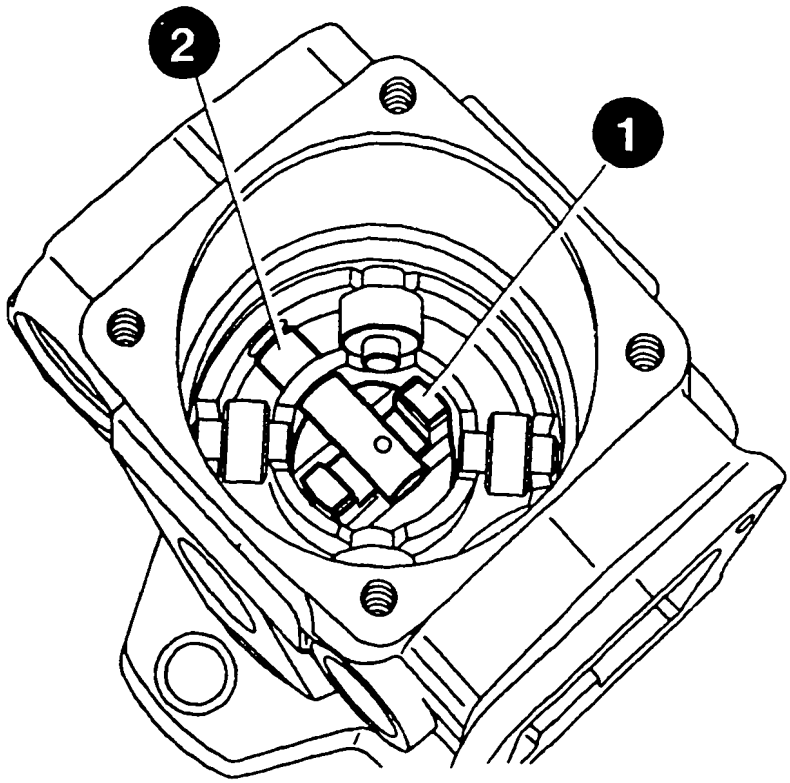
1 = Claws
2 = Sliding bolt

Set claws of drive shaft to transverse position.

Push sliding bolt in direction of center of cam roller ring (arrow).

Continue: E18/1 Fig.: E17/2

KMK03342



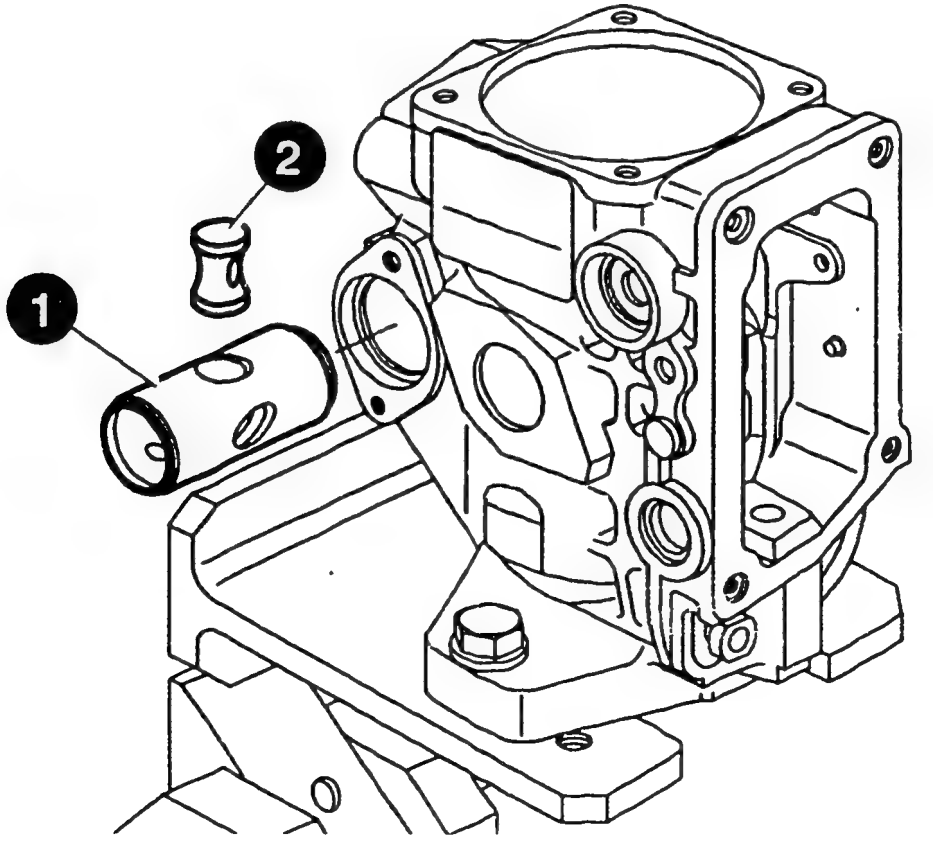
## REMOVING CAM ROLLER RING AND TIMING-DEVICE PISTON

1 = Timing-device piston
2 = Sliding piece

Push out timing-device piston including sliding piece (pay attention to sliding piece!).
If applicable, remove closing cover on side for pointer adjustment, remove seal ring and unscrew adjustment plate.

Continue: E19/1 Fig.: E18/2

KMK03343

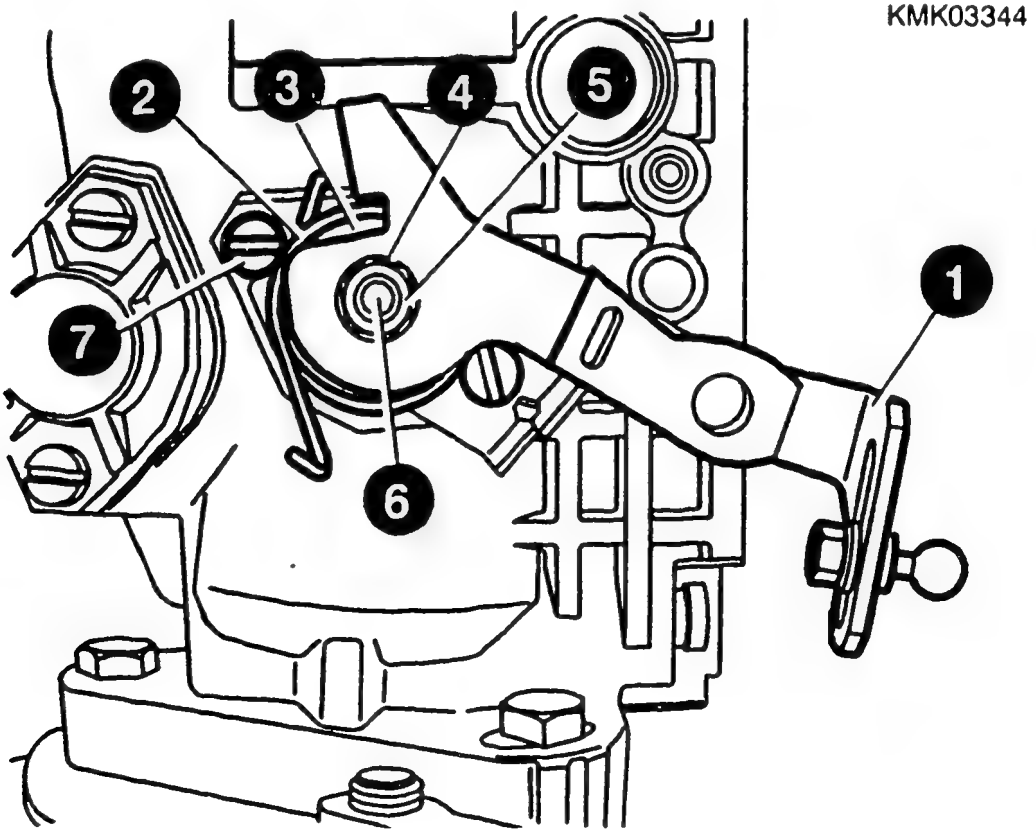


REMOVING TEMPERATURE-CONTROLLED COLD START ACCELERATION DEVICE (KSB) ACTING ON CAM ROLLER RING

1 = Control lever
2 = Cylindrical helical coiled spring
3 = Shim
4 = Spring lock washer
5 = Hexagon nut
6 = Setting shaft
7 = Fillister-head screw

Disengage cylindrical helical coiled spring at control lever. Remove hexagon nut with spring lock washer. Pull control lever off setting shaft. Remove fillister-head screws and spring lock washers.

Continue: E20/1 Fig.: E19/2



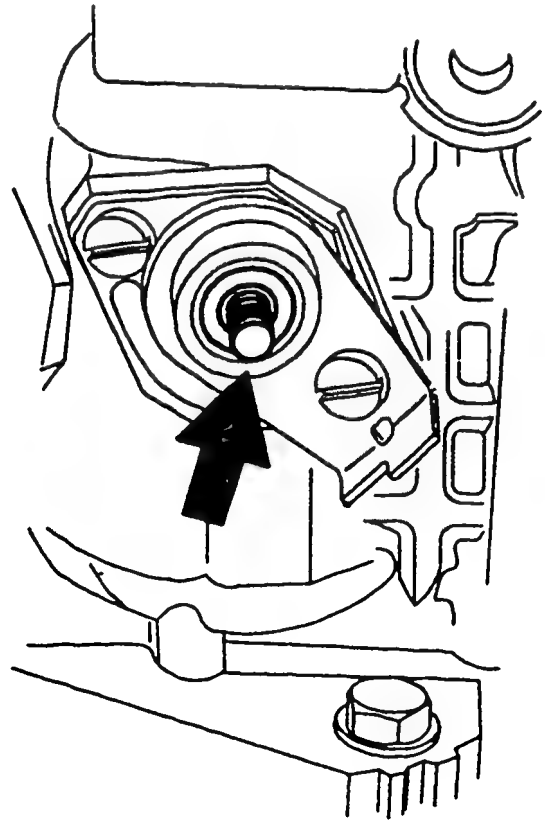
REMOVING TEMPERATURE-CONTROLLED COLD START ACCELERATION DEVICE (KSB) ACTING ON CAM ROLLER RING

Arrow = Setting shaft

Remove fitting cover complete with setting shaft from distributor-type fuel-injection pump.
Remove O-ring from pump housing.

Continue: E21/1 Fig.: E20/2

KMK03345



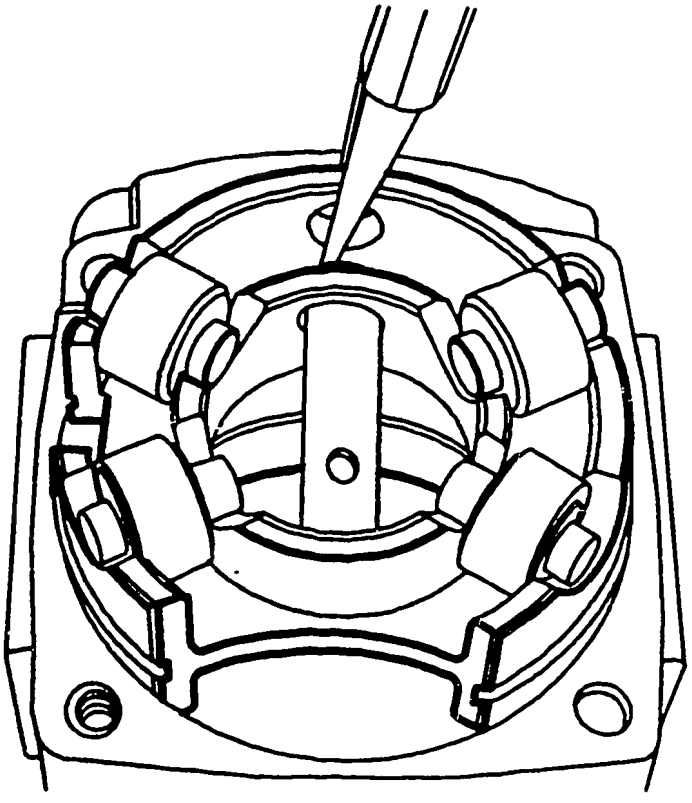
## REMOVING CAM ROLLER RING

Lift out cam roller ring with rollers taking care not to tilt it.

Note:
Do not interchange rollers!

Continue: E22/1 Fig.: E21/2

KMK03346



REMOVING CAM ROLLER RING

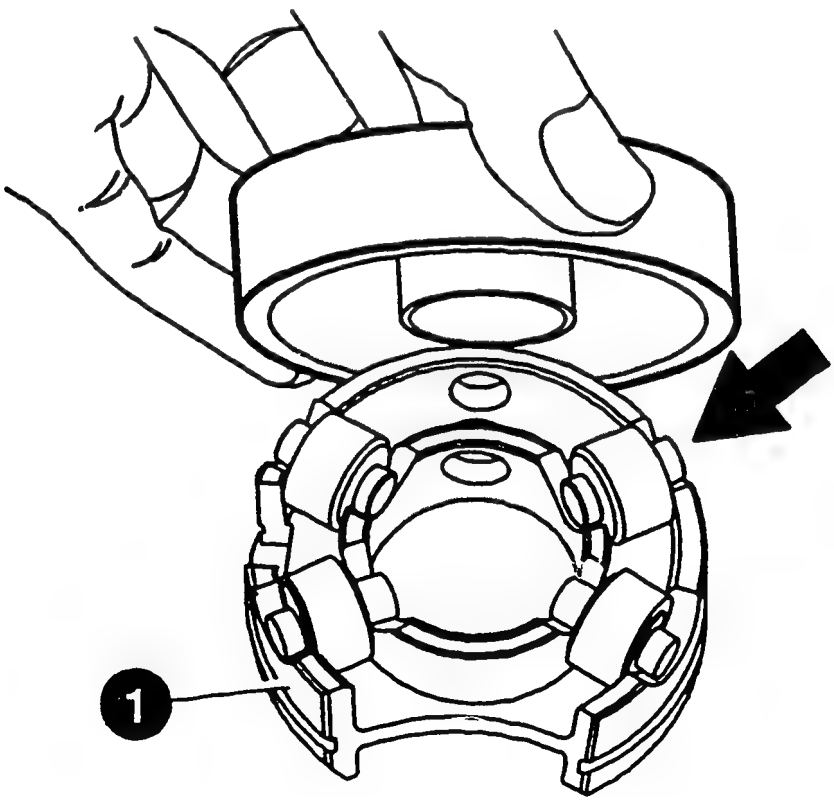
1 = Cam roller ring

Push sliding bolt out of cam roller ring.

Position protective capsule KDEP 1100 over cam roller ring to protect rollers (arrow).

Continue: E23/1 Fig.: E22/2

KMK03347

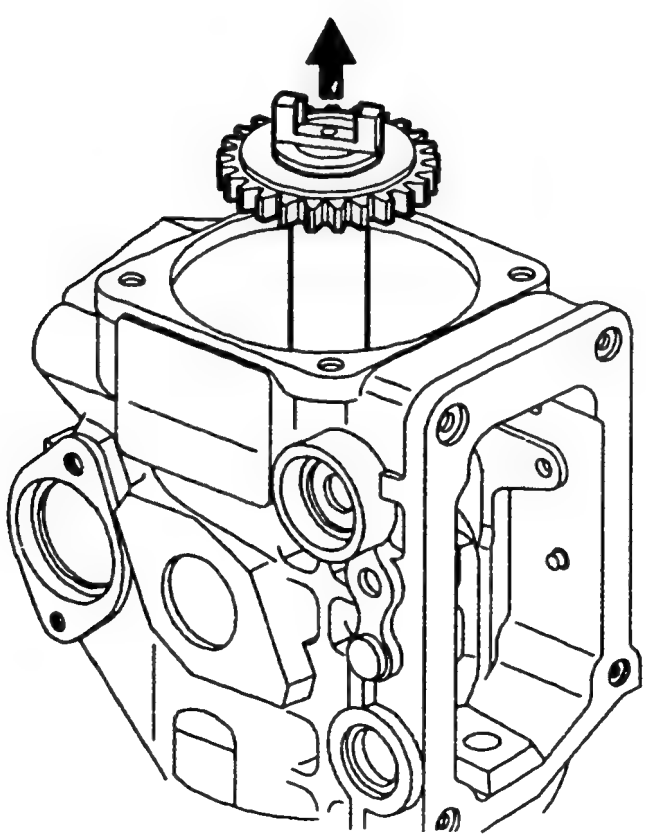


## REMOVING DRIVE SHAFT

Remove radial-lip-type oil seal with extractor KDEP 1113 or KDEP 1114 (depending on shaft diameter).
Push out drive shaft upwards.
Pay attention to Woodruff key.

Continue: E24/1 Fig.: E23/2

KMK03348



## REMOVING DRIVE SHAFT

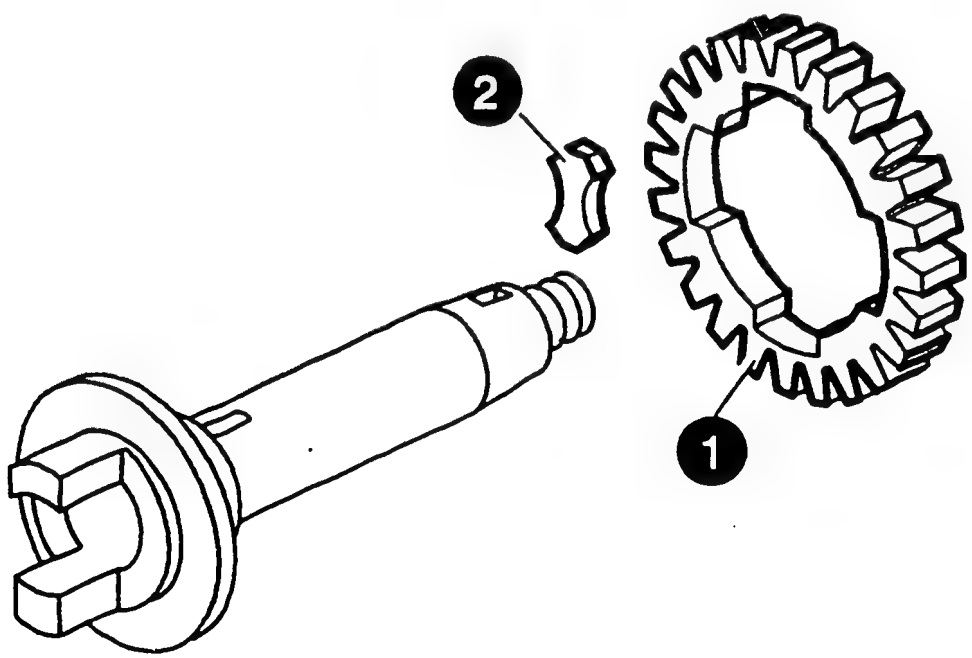
1 = Gear wheel
2 = Rubber buffer

Remove gear wheel and rubber buffer from drive shaft.

Remove slotted washer from housing.

Continue: E25/1 Fig.: E24/2

KMK03349



## REMOVING VANE-TYPE SUPPLY PUMP

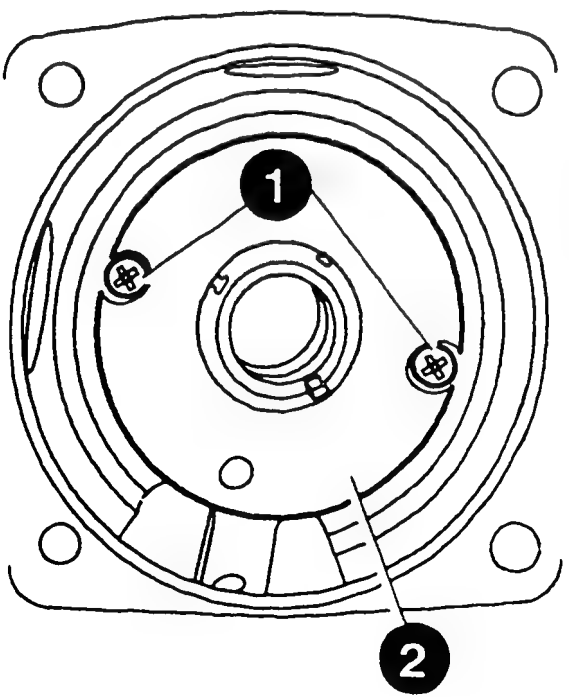
1 = Countersunk screws
2 = Support ring

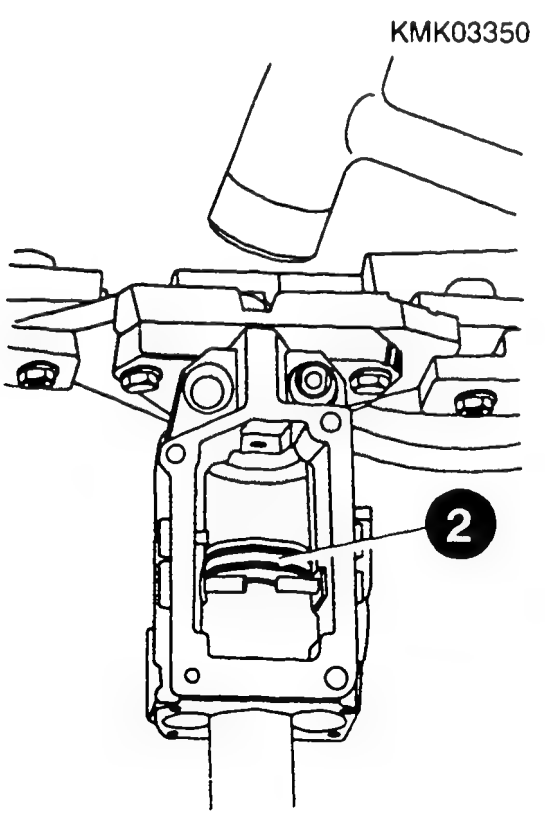
Loosen and remove countersunk screws (picture, left).

Insert assembly tool KDEP 1097 into pump housing.

Tilt housing downwards; in doing so, counterhold support ring with holding mandrel KDEP 1097.

Continue: E26/1 Fig.: E25/2



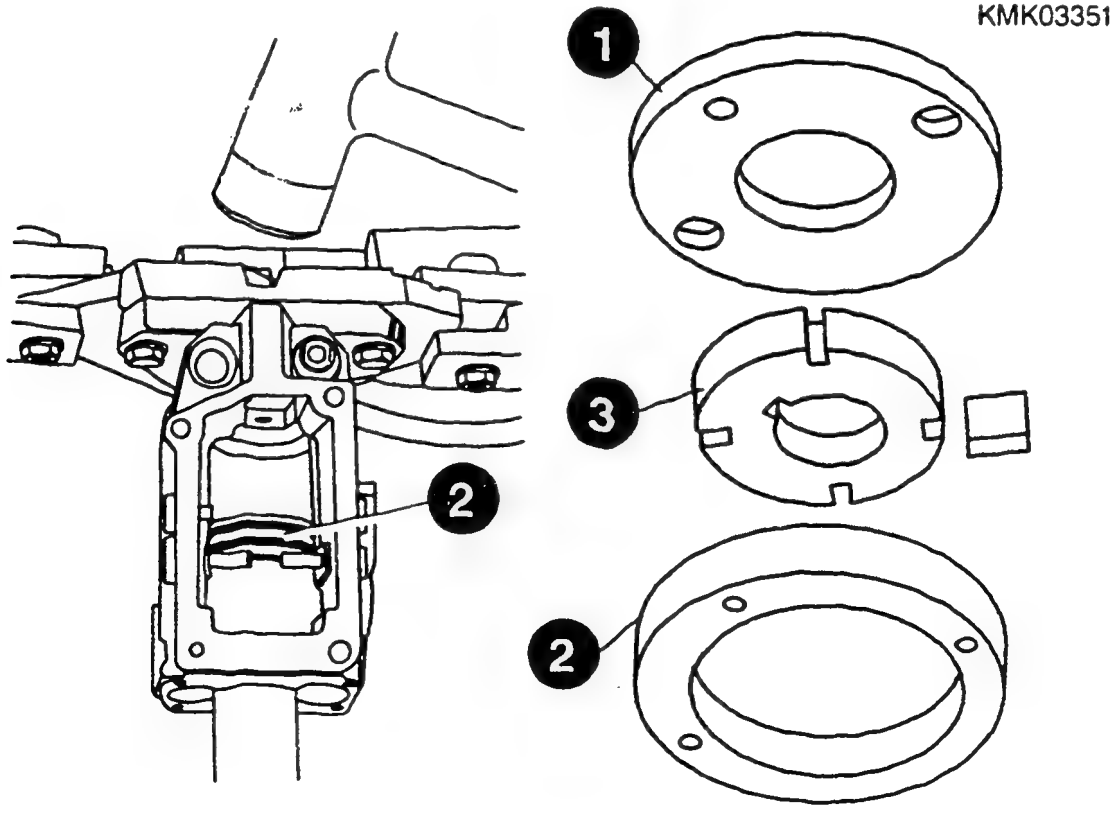



REMOVING VANE-TYPE SUPPLY PUMP

1 = Support ring
2 = Holding ring
3 = Slotted washer with pump vanes

Whilst constantly tapping on pump housing with rubber hammer, remove (downwards) support ring and supply pump consisting of slotted washer with pump vane and holding ring (eccentric ring).

Continue: E27/1 Fig.: E26/2



REMOVING VANE-TYPE SUPPLY PUMP

1 = Supporting plate
2 = Pump impeller

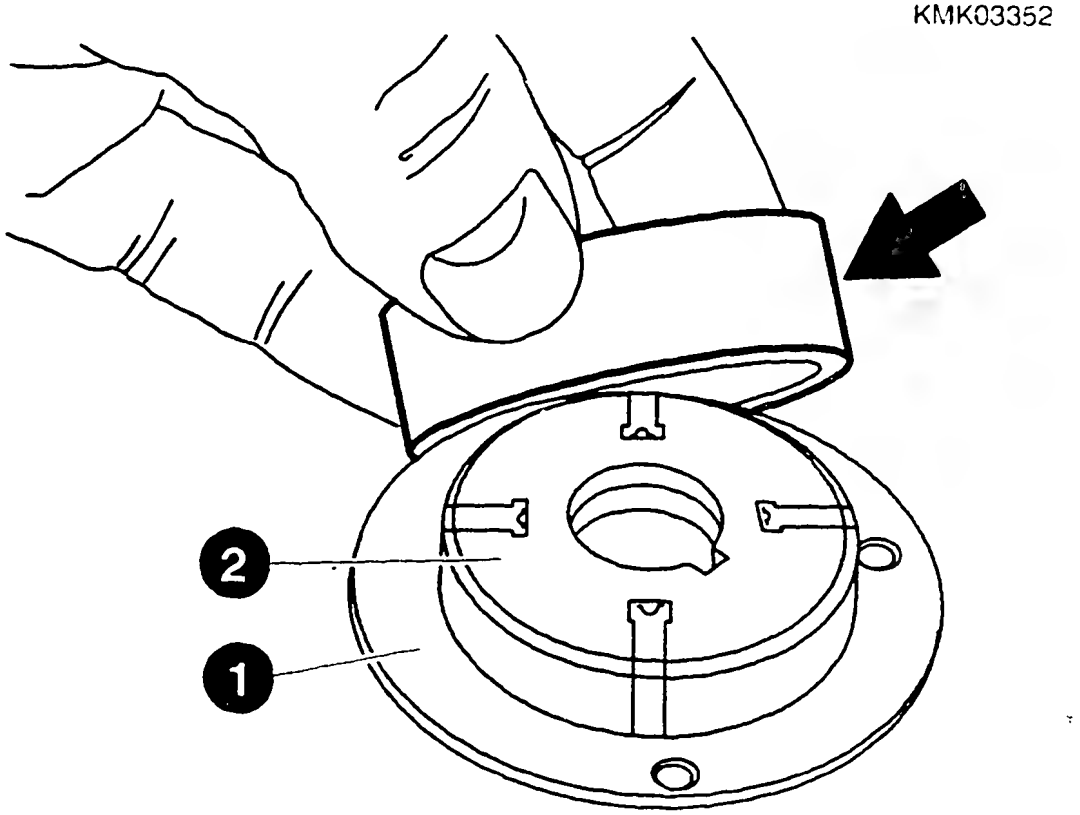
Remove supporting plate with slotted washer from assembly tool KDEP 1097. Position KDEP 1101 (arrow) over supporting plate and pump impeller.

In the event of tilted holding ring, pay attention to operations on Coordinate E28/1.

Holding ring not tilted, continue on Coordinate F03/1

Continue: E28/1 Fig.: E27/1

KMK03352



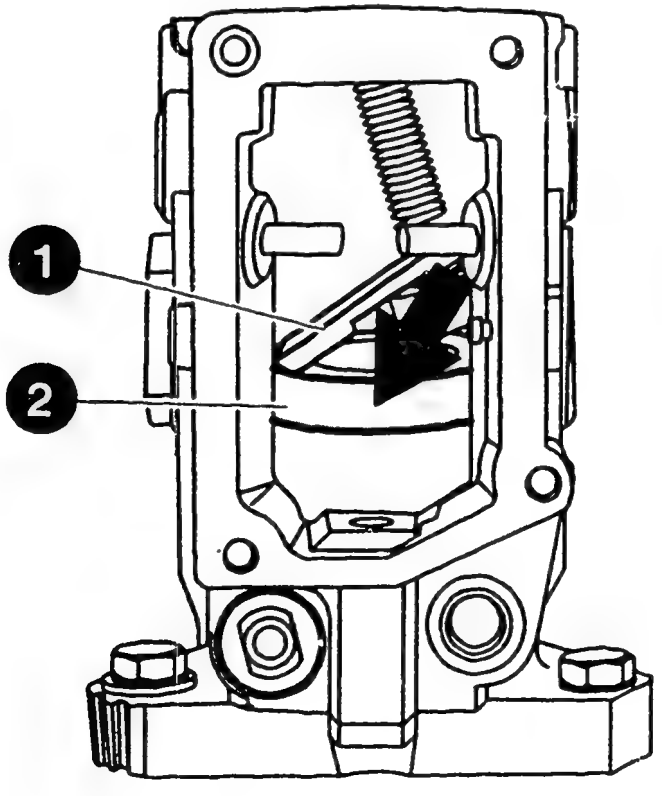
REMOVING VANE-TYPE SUPPLY PUMP
* Holding ring tilted

1 = Extractor
2 = Holding ring

Slip extractor of assembly tool KDEP 1097 behind supporting ring (eccentric ring) as shown by arrow.

Continue: F01/1 Fig.: E28/2

KMK03353



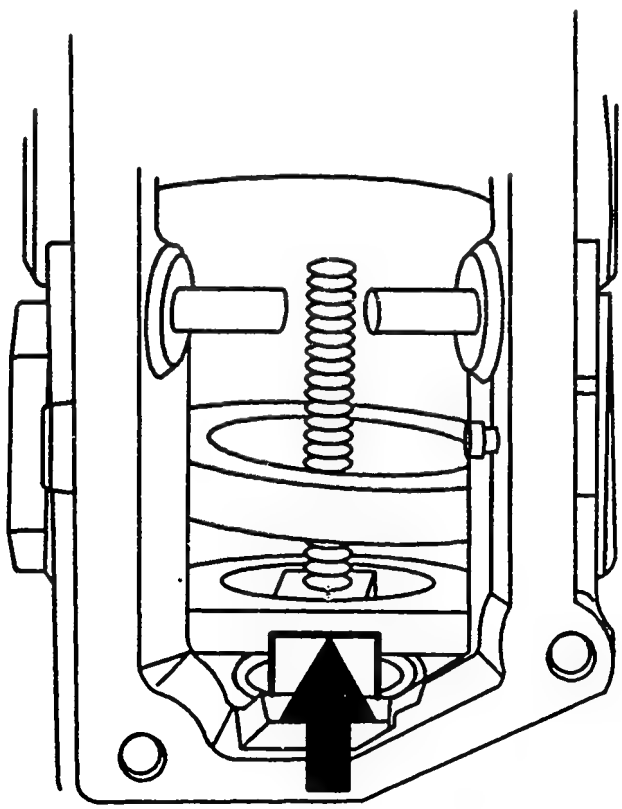
REMOVING VANE-TYPE SUPPLY PUMP
* Holding ring tilted

Centrally align extractor.

The milled surfaces of the threaded pin should be in the groove of the extraction part (arrow).

Continue: F02/1 Fig.: F01/2

KMK03354



REMOVING VANE-TYPE SUPPLY PUMP
* Holding ring tilted

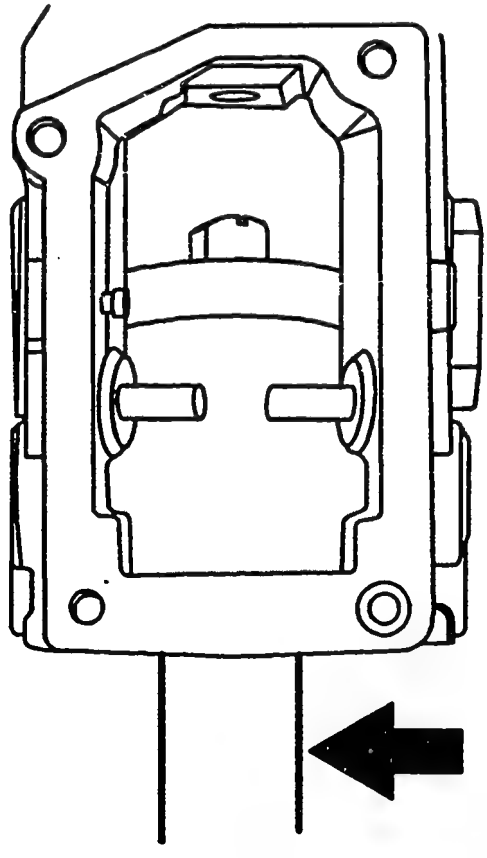
Remove support mandrel of vane-type pump from assembly tool KDEP 1097.

Insert assembly tool (arrow) into pump housing and screw onto threaded pin.

The holding ring (eccentric ring) is thus pulled towards the assembly tool.

Pull assembly tool with holding ring out of pump housing.
Check for damage and abrasion on inside of pump housing.

Continue: F03/1 Fig.: F02/2



KMK03355

DISASSEMBLING CONTROL DEVICE OF TEMPERATURE-CONTROLLED IDLE INCREASE (TLA)

1 = Control device
2 = Hexagon-socket-head cap screws
3 = Support plate

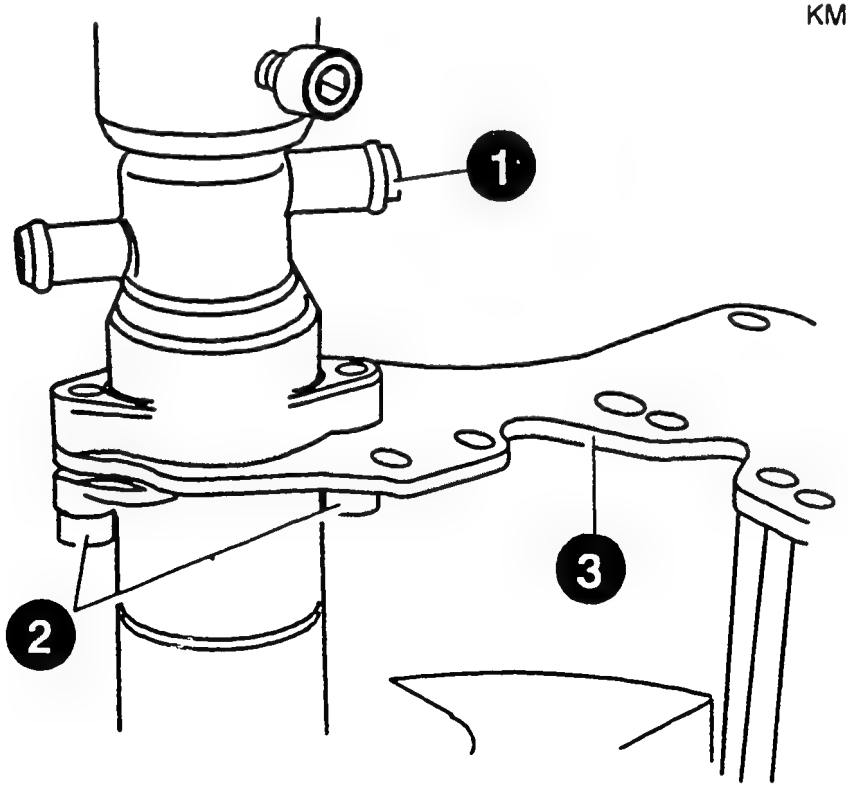
Insert control device into assembly device KDEP 1109.

Slightly squeeze control device together with mandrel press.

Screw out hexagon-socket-head cap screws.

Continue: F04/1 Fig.: F03/2

KMK03356



## DISASSEMBLING CONTROL DEVICE OF TEMPERATURE-CONTROLLED IDLE INCREASE (TLA)

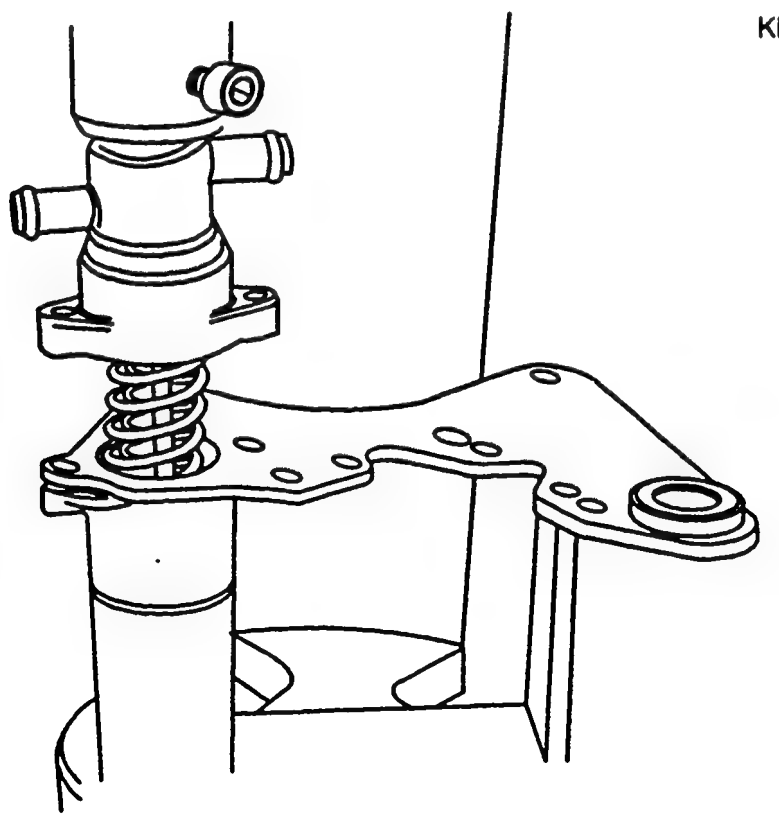
Relieve tension on compression springs of control device.

Remove both compression springs.

Remove spring seat with cable.

Continue: F05/1 Fig.: F04/2

KMK03357



DISASSEMBLING CONTROL DEVICE OF TEMPERATURE-CONTROLLED IDLE INCREASE (TLA)

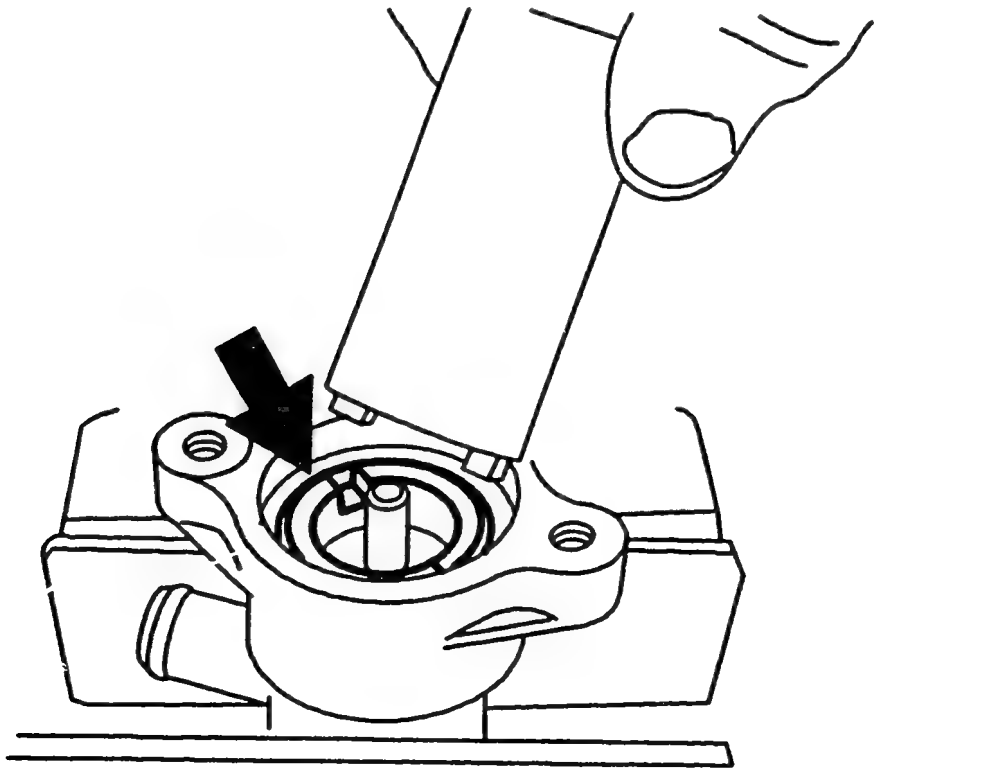
Clamp control device with protective jaws in vice.

Screw out threaded ring (arrow) with pin-type socket wrench KDEP 1110.

Remove thermostat and O-ring from housing.
NOTE:
Do not pull pin out of thermostat.

Continue: F06/1 Fig.: F05/2

KMK03358



## CLEANING OF COMPONENT PARTS

Wash out component parts in commercially available cleaner such as chlorothene NU which is not readily flammable. Then blow out with compressed air.

Continue: F06/2

## CLEANING OF COMPONENT PARTS

Pay attention to the following safety precautions:
Order Governing Work with Flammable Liquids (Vbf) as issued by Federal Labor Ministry (BmA).
Safety regulations for handling chlorinated hydrocarbons:

| | |
|---|---|
| For companies | ZH 1/222 |
| For employees | ZH 1/129 |

as published by the Hauptverband für gewerbliche Berufsgenossenschaften (Zentralverband für Unfallschutz und Arbeitsmedizin),
Langwartweg 103, 5300 Bonn 5.
The appropriate local regulations are to be observed in other countries.

Continue: F07/1

## CHECKING INDIVIDUAL COMPONENT PARTS - WEAR ASSESSMENT

Renew worn and damaged parts.
The helices of the distributor-pump plunger must be sharp and there must not be any pronounced tracking on the running surfaces. Distributor-pump plunger and control spool, cam roller ring with rollers and spring seat, slotted washer with pump vane and holding ring are to be viewed as a unit and renewed together in each case (service part assemblies)!
Use must always be made of new seal rings and O-rings when performing repairs.

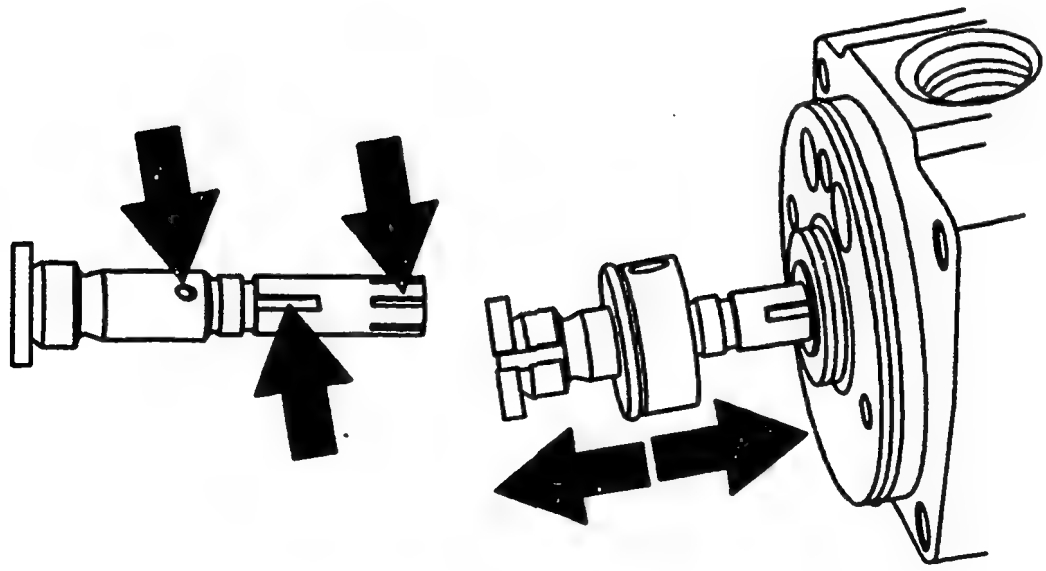
Continue: F08/1

## CHECKING INDIVIDUAL COMPONENT PARTS – WEAR ASSESSMENT

Particular attention is to be paid to the sharpness of the helices on the distributor-pump plunger (picture, left). A check is likewise to be made on the freedom of movement of the distributor-pump plunger in the distributor head and control spool (picture, right). If one of these component parts reveals pronounced signs of tracking, distributor head must be renewed complete with distributor-pump plunger and control spool. These parts are paired in terms of dimensions and cannot be individually replaced.

Continue: F09/1 Fig.: F08/2

KMK03359



## CHECKING INDIVIDUAL COMPONENT PARTS – WEAR ASSESSMENT

Ultimate assessment of the wear of the distributor-pump plunger with distributor head and control spool is only possible on a test bench.

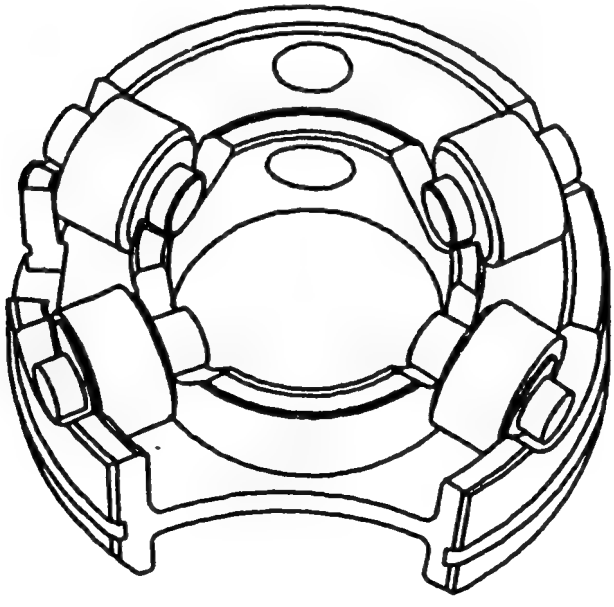
Continue: F10/1

## CHECKING INDIVIDUAL COMPONENT PARTS – WEAR ASSESSMENT

Clean cam roller ring with fitted protective capsule KDEP 1100 in cold cleaner (wash out).
Check condition of rollers and freedom of movement. (In doing so, do not take rollers out of cam roller ring).

Continue: F11/1 Fig.: F10/2

KMK03360

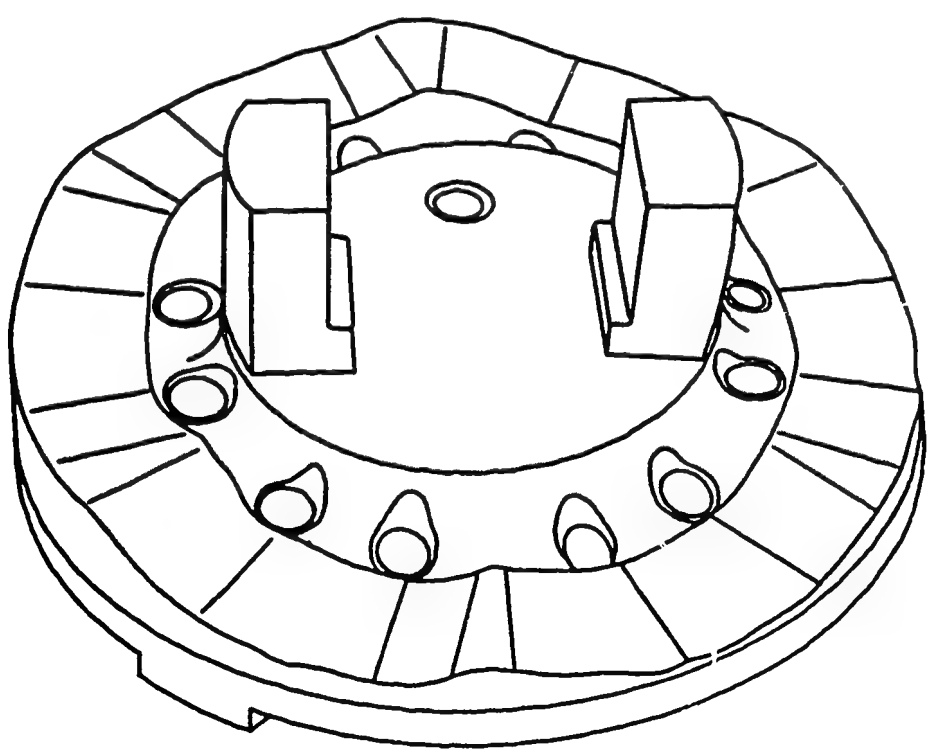


## CHECKING INDIVIDUAL COMPONENT PARTS – WEAR ASSESSMENT

Check camways of cam plate for wear. Cam plate must be renewed if it shows signs of tracking or blue tarnishing. In such cases, it may be necessary to replace the complete cam roller ring since the rollers will probably also be very worn.

Continue: F12/1 Fig.: F11/2

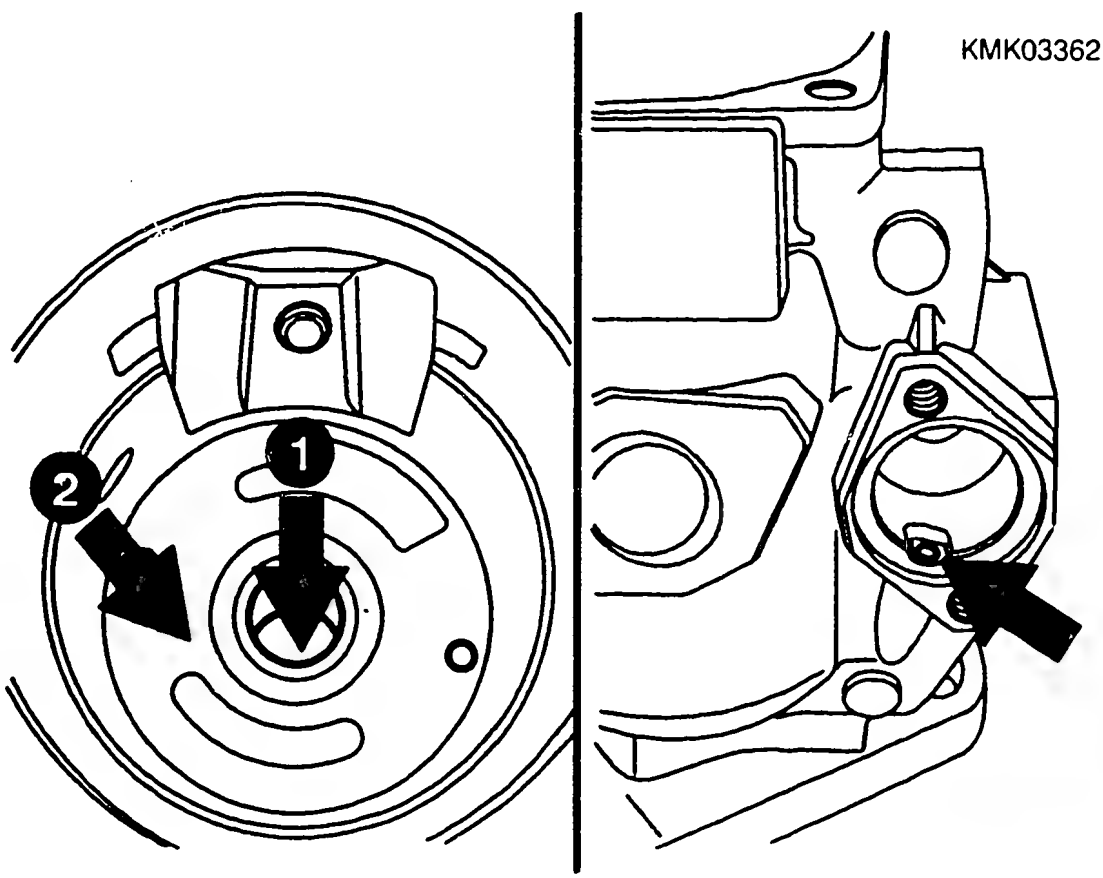
KMK03361



## CHECKING INDIVIDUAL COMPONENT PARTS - WEAR ASSESSMENT

Check for scoring on plain bearing in pump housing (arrow 1) as well as on stopping surface of supply pump at bottom of housing (arrow 2) and in hole for timing device (arrow, right picture).

Continue: F13/1 Fig.: F12/2



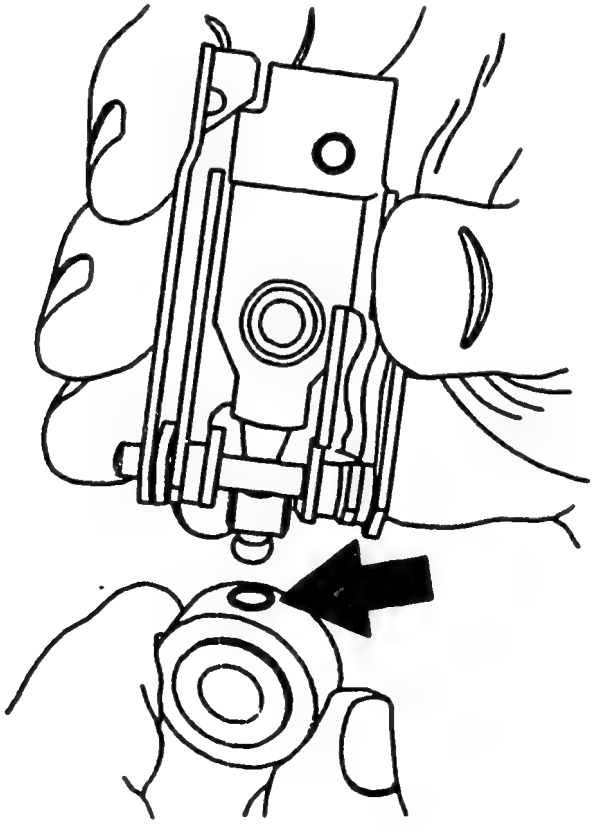
## CHECKING INDIVIDUAL COMPONENT PARTS - WEAR ASSESSMENT

Check freedom of movement and tightness of ball stud of fulcrum lever assembly in control-spool bore (arrow).

If necessary, renew fulcrum-lever assembly/control spool including distributor-pump plunger and distributor head.

Continue: F14/1 Fig.: F13/2

KMK03363



REPLACING BUSHINGS (1-PIECE) OF DRIVE SHAFT

* Special tools required:

Tool set KDEP 1170 for drive shaft diameter 17.0 mm comprising:

| | |
|---|---|
| * Pressing-out mandrel | KDEP 1170/1 |
| * Pressing-in mandrel<br>Pressing in inner bushing | KDEP 1170/2 |
| * Pressing-in mandrel<br>Pressing in outer bushing | KDEP 1170/3 |
| * Guide sleeve | KDEP 1170/4 |
| * Hand reamer | KDEP 1170/5 |
| * Support | KDEP 1170/6 |

Continue: F14/2

REPLACING BUSHINGS OF DRIVE SHAFT

Tool set KDEP 1171 for drive shaft diameter 20.0 mm comprising:

| | |
|---|---|
| * Pressing-out mandrel | KDEP 1171/1 |
| * Pressing-in mandrel<br>(Pressing in inner bushing) | KDEP 1171/2 |
| * Pressing-in mandrel<br>(Pressing in outer bushing) | KDEP 1171/3 |
| * Guide sleeve | KDEP 1171/4 |
| * Hand reamer | KDEP 1171/5 |

Note:

Use support KDEP 1170/6 to guide pressing-in mandrel KDEP 1171/2 and hand reamer.

Continue: F15/1

PRESSING IN DRIVE SHAFT BEARING
- Version: 2-piece bushing

Select further adjustment in line with following features:

* Pressing out bushing, diameter 17 mm and 20 mm F16/1
* Pressing in bushing F17/1
* Reaming out bushing, diameter 20 mm F20/1
* Reaming out bushing, diameter 17 mm F22/1

- Version: 1-piece bushing F25/1

Continue: F16/1

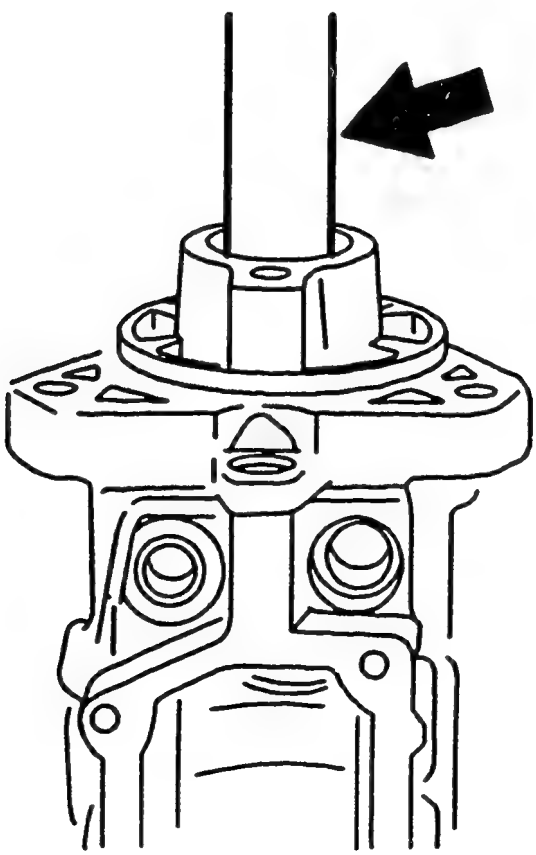
## REPLACING BUSHINGS OF DRIVE SHAFT

Arrow = Pressing-out mandrel

Position injection-pump housing with support KDEP 1170/6 flat on mounting plate of mandrel press.
Remove any burr on pump housing (end face of distributor head).

Press out bushings on drive end with pressing-out mandrel depending on drive shaft diameter.
Wash out VE housing; there must be no grease in hole.

Continue: F17/1 Fig.: F16/2



KMK03364

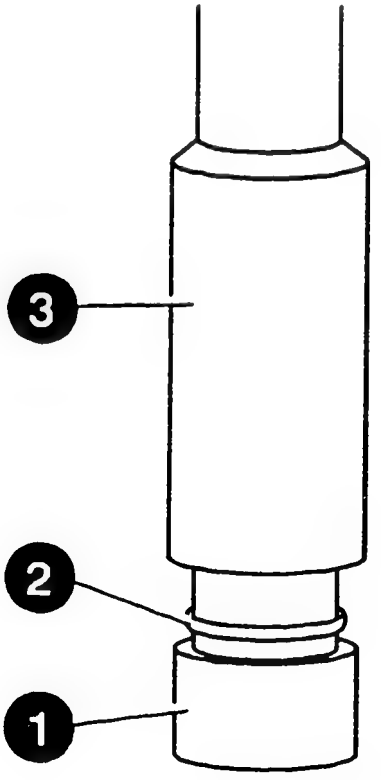
## PRESSING IN BUSHINGS

1 = Bushing
2 = O-ring
3 = Pressing-in mandrel

Position pump housing flat on mounting plate of mandrel press on drive end. Slip new bushing over O-ring of pressing-in mandrel depending on drive shaft diameter.

Continue: F18/1 Fig.: F17/2

KMK03365



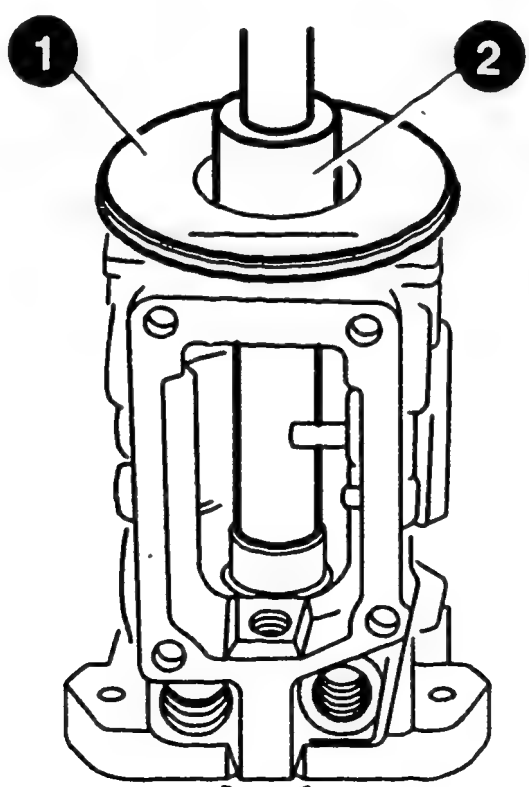
## PRESSING IN BUSHINGS

1 = Support ring
2 = Guide sleeve

Apply Loctite 582 to O.D. of bushing.
Insert support ring into pump housing.
Place guide sleeve in support ring.
Press inner bushing straight and flush into pump housing until contact is made.

Continue: F19/1 Fig.: F18/2

KMK03366



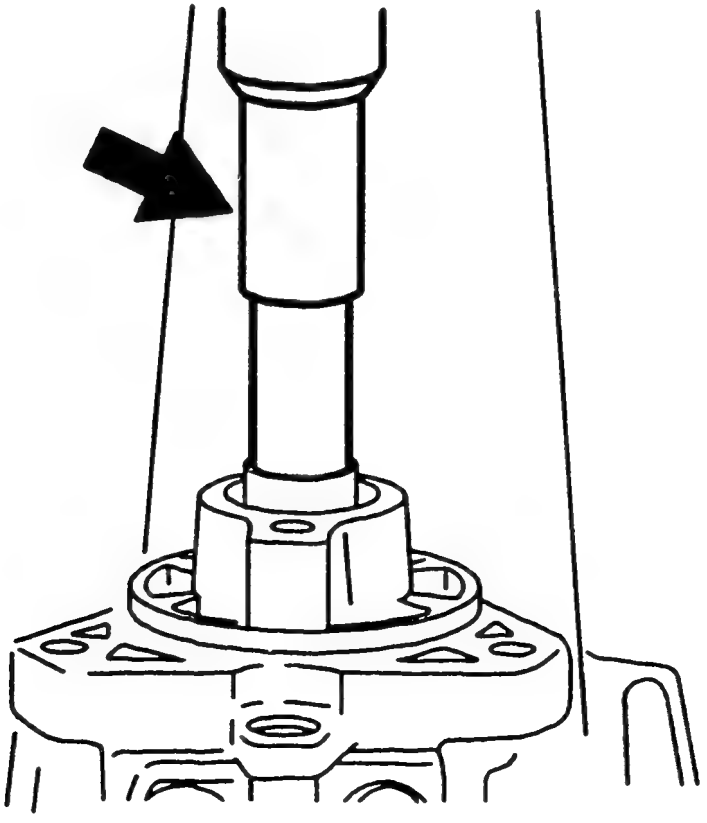
PRESSING IN BUSHINGS

Arrow = Pressing-in mandrel with long guide pin

Insert support KDEP 1170/6 in pump housing.
Position injection-pump housing with support on mounting plate of mandrel press.
Mount bushing in pressing-in bushing with long guide pin.
Apply Loctite 582 to O.D. of bushing.
Insert pressing-in mandrel into bushing already pressed in and press in bushing flush on drive end.
Remove residual adhesive.

Continue: F20/1 Fig.: F19/2

KMK03367



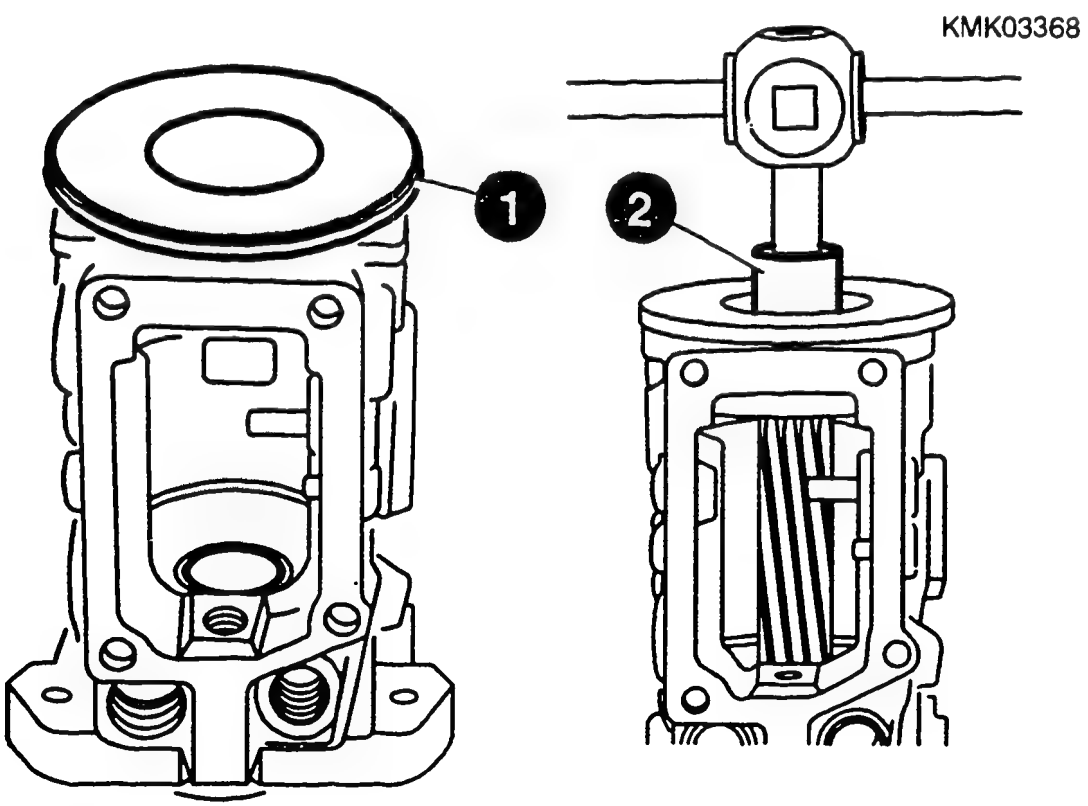
REAMING OUT BUSHINGS
 – Shaft diameter 20 mm

Shaft diameter 17 mm, continue as per Coordinate F22/1

1 = Support ring
2 = Guide sleeve

Place injection–pump housing flat on support plate on drive end. Insert support ring into pump housing. Insert hand reamer into support ring. Insert guide sleeve in line with reamer diameter in support ring. (Shouldered collar faces upwards).

Continue: F21/1  Fig.: F20/2



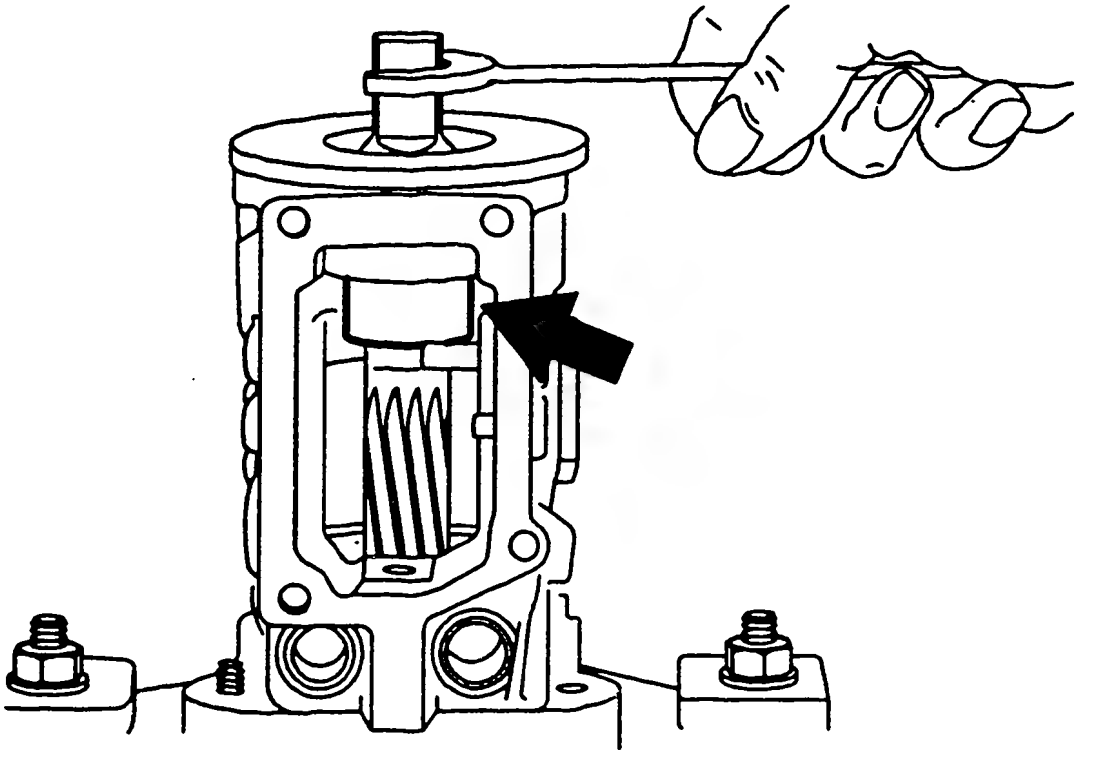
REAMING OUT BUSHINGS
- Shaft diameter 20 mm

Place wrench on reamer and ream out inner bushing with oil.
Turn guide sleeve (shouldered collar diameter faces towards pump housing - arrow).

Ream out second bushing.
Ream last 2 cm with guide sleeve and open-ended wrench.
Insert drive shaft and check for freedom of movement.
Make repair mark.

Continue: G05/1 Fig.: F21/2

KMK03369



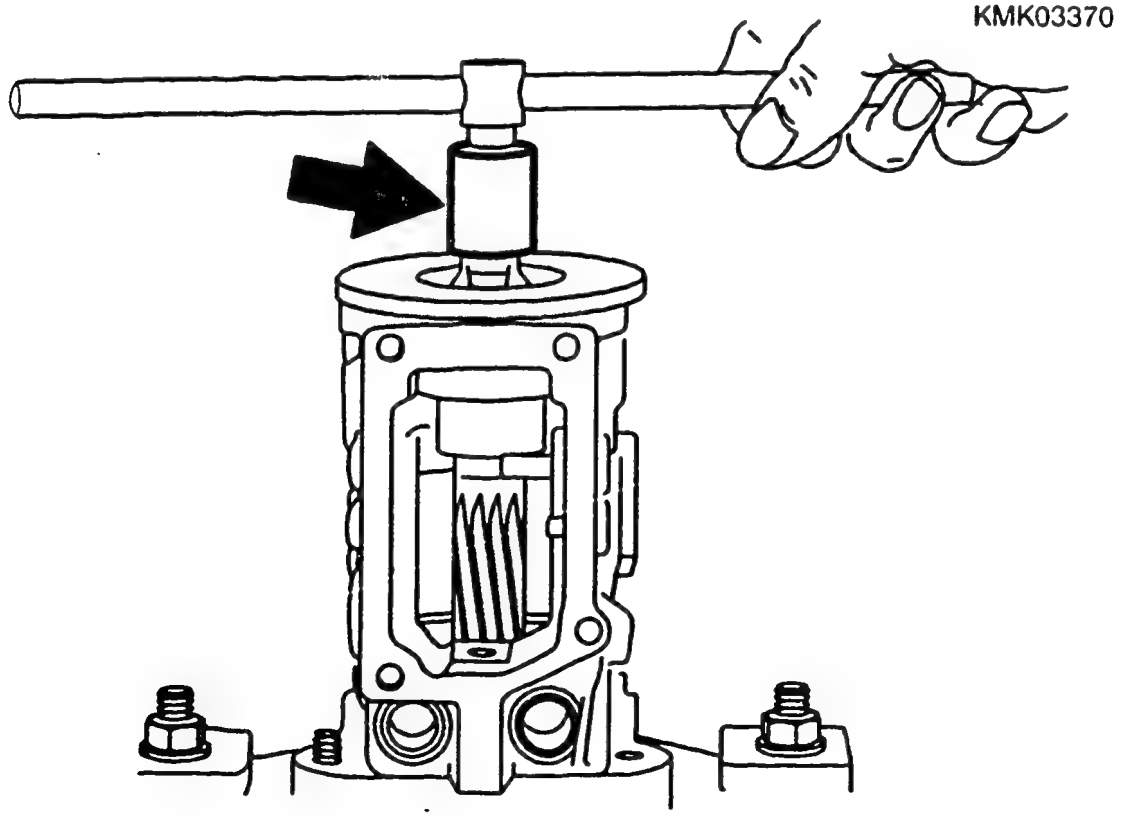
REAMING OUT BUSHINGS
- Shaft diameter 17 mm

Arrow = Intermediate piece

Place injection-pump housing flat on support plate on drive end. Insert support ring into pump housing.
Insert hand reamer into support ring.
Insert guide sleeve in line with reamer diameter in support ring.
* Shouldered collar faces upwards.

Insert intermediate piece into square of hand reamer.

Continue: F23/1 Fig.: F22/2



REAMING OUT BUSHINGS
- Shaft diameter 17 mm

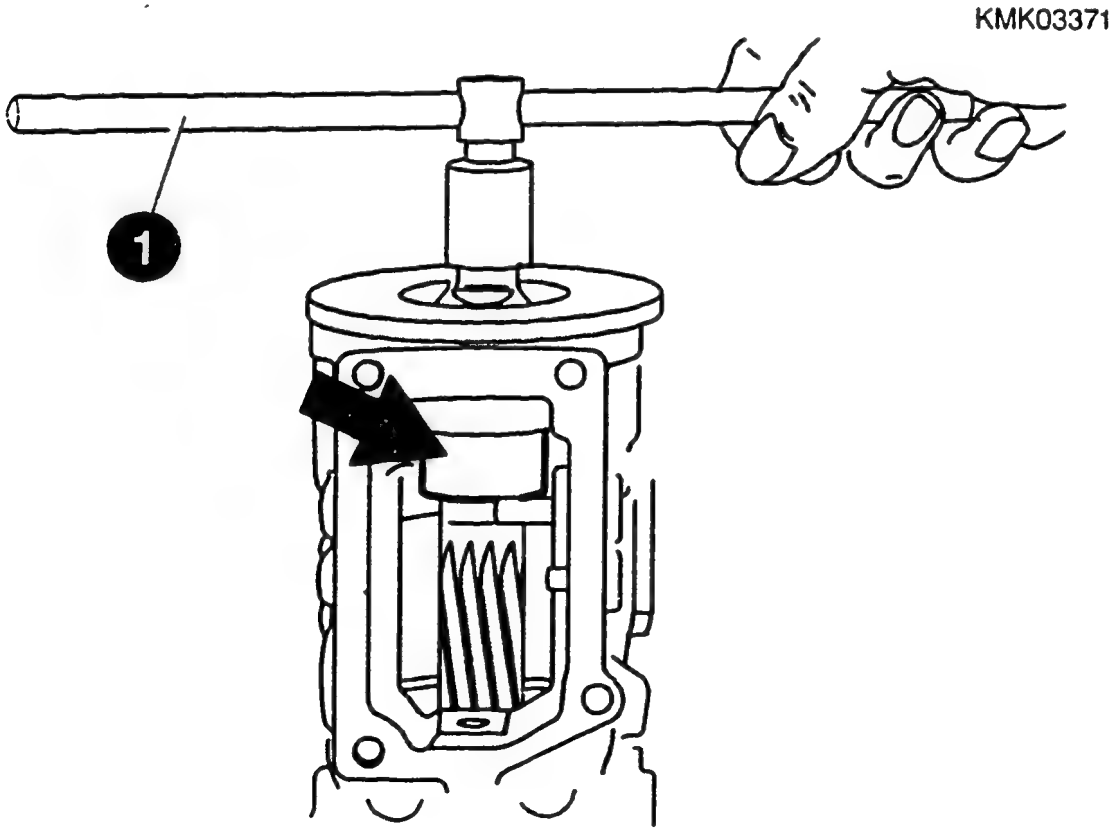
1 = Toggle

Insert toggle in intermediate piece.
Ream out inner bushing with oil.

Turn guide sleeve (shouldered collar diameter faces pump housing - arrow).

Continue: F24/1 Fig.: F23/2

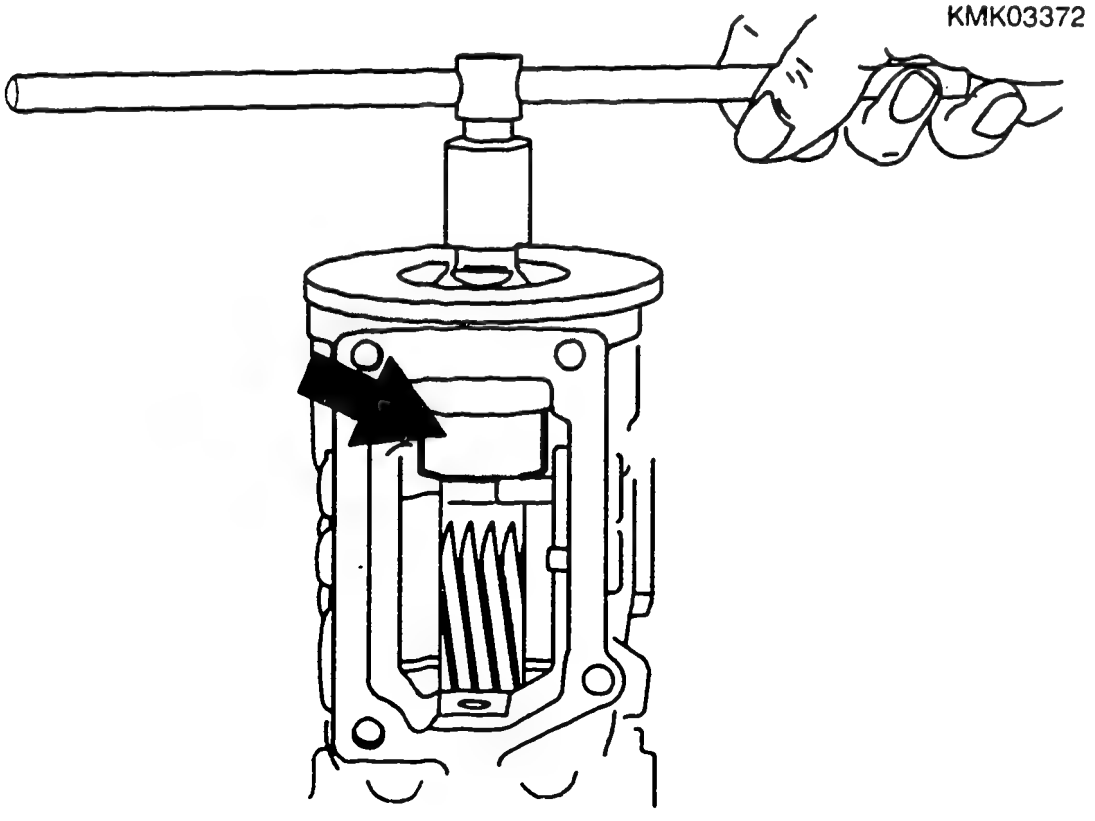
KMK03371



REAMING OUT BUSHINGS
- Shaft diameter 17 mm

Ream out second bushing.
Ream last 2 cm without guide sleeve (arrow).
Insert drive shaft and check for freedom of movement.
Make repair mark.

Continue: G05/1 Fig.: F24/2



## PRESSING OUT 1-PIECE BUSHING

Tool set KDEP 1171 for drive shaft diameter 20.0 mm comprising:

| | |
|---|---|
| * Drill bush | KDEP 1882 |
| * Pressing-out mandrel | KDEP 1171/1 |
| * Pressing-in mandrel | KDEP 1171/2 |
| * Pressing-in mandrel | KDEP 1171/3 |
| * Guide sleeve | KDEP 1171/4 |
| * Hand reamer | KDEP 1171/5 |

* Drill 7.6 mm commercially available

Note:
Use support KDEP 1170/6 to guide pressing-in mandrel KDEP 1171/2 and hand reamer.

Continue: F26/1

## REPLACING BUSHING OF DRIVE SHAFT

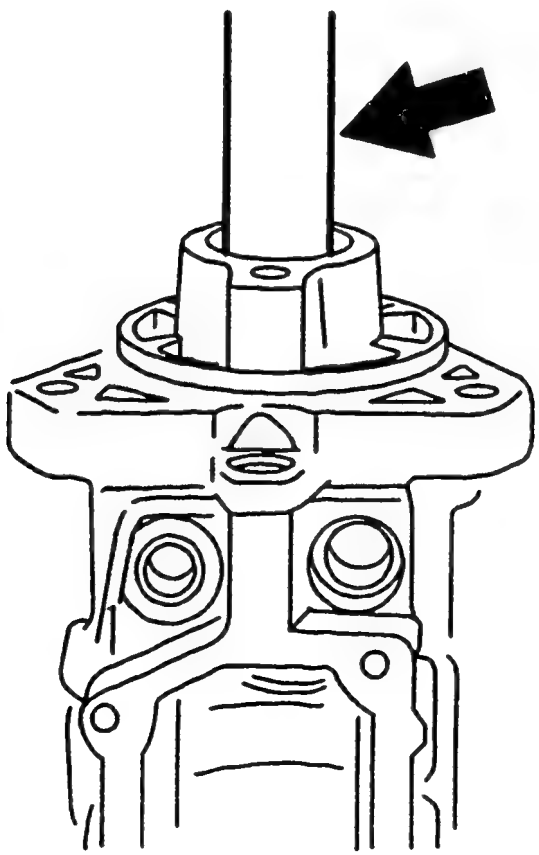
Arrow = Pressing-out mandrel

Position injection-pump housing with support KDEP 1170/6 flat on support plate on mandrel press. Remove any burr on pump housing (end face of distributor head).

Press out bushing on drive end with pressing-out mandrel KDEP 1171/1. Wash out VE housing; there must not be any grease in hole.

Continue: F27/1 Fig.: F26/2

KMK03364

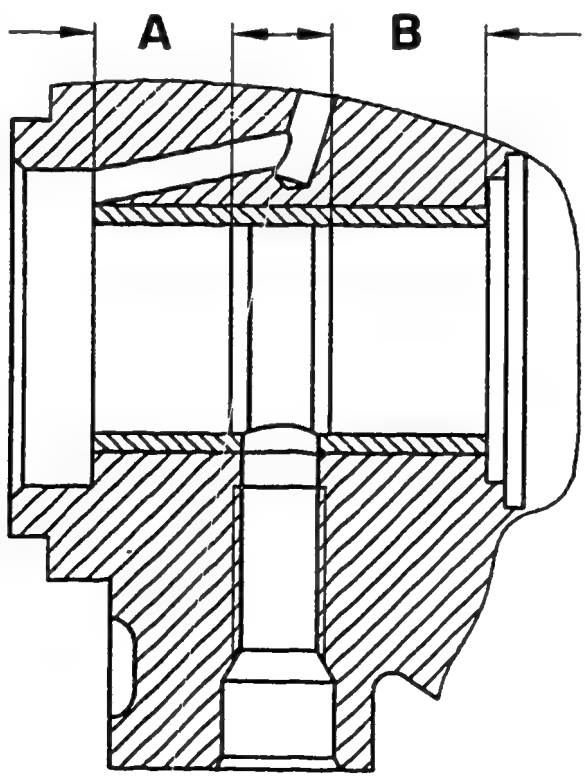


## REPLACING BUSHING OF DRIVE SHAFT

Before installing 1-piece bushing, measure bearing surfaces "A" and "B". The long side must face the interior of the pump on pressing in.

Continue: F28/1 Fig.: F27/2

KMK03373



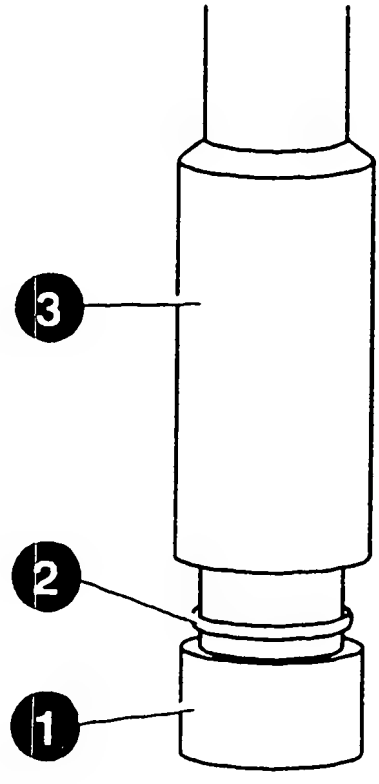
PRESSING IN BUSHING

1 = Bushing
2 = O-ring
3 = Pressing-in mandrel

Position pump housing flat on support plate of mandrel press on drive end. Slip bushing with long bearing surface over O-ring of pressing-in mandrel.

Continue: G01/1 Fig.: F28/2

KMK03365



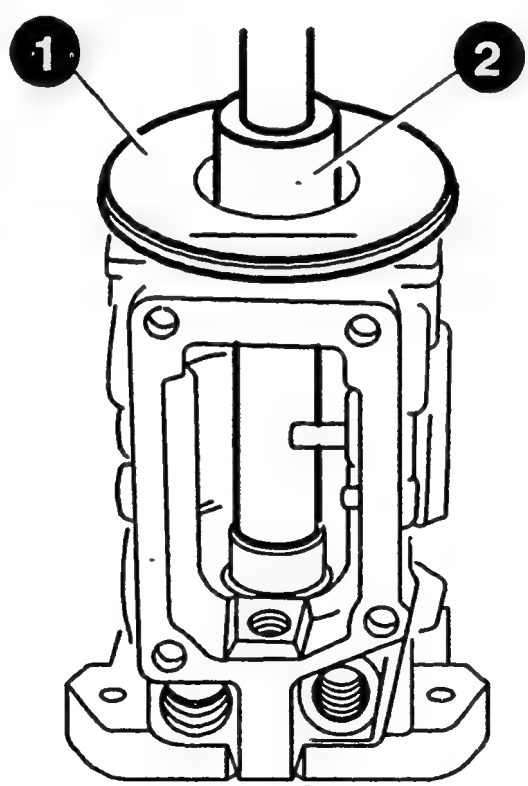
PRESSING IN BUSHING

1 = Support ring
2 = Guide sleeve

Apply Loctite 582 to O.D. of bushing.
Insert support ring into pump housing.
Press bushing flat and flush into pump housing until it makes contact.

Continue: G02/1 Fig.: G01/2

KMK03366



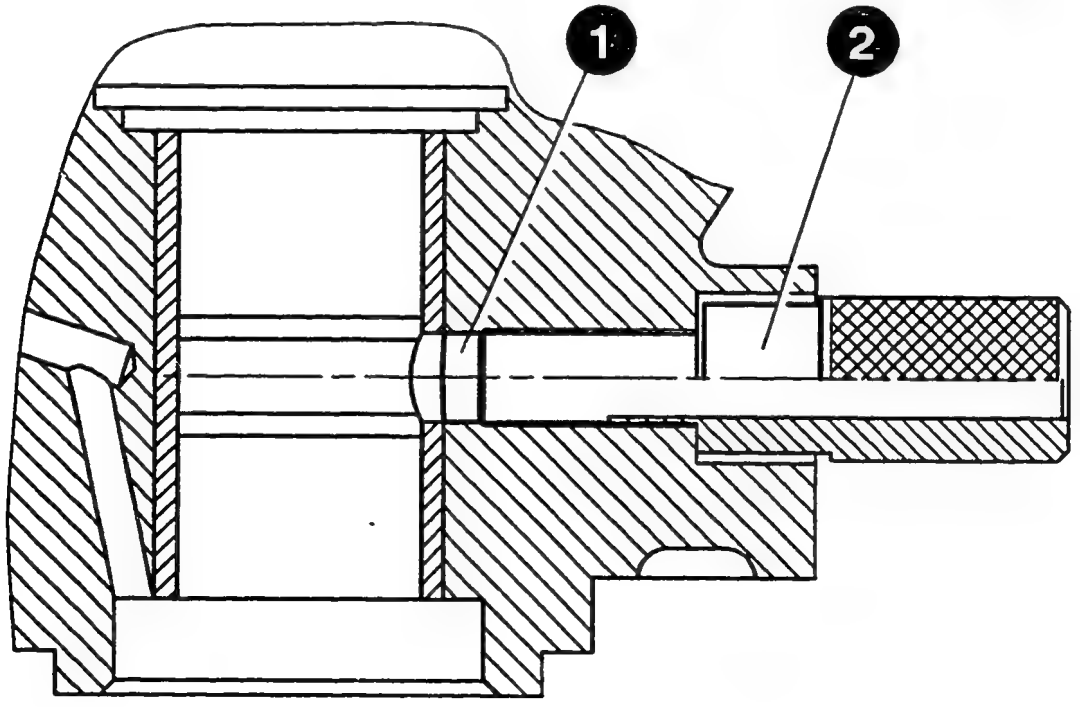
## DRILLING OUT BUSHING

1 = Hole, locked timing
2 = Drill bushing

Drill out bushing on pumps with tapped hole on side for locked timing.
To do so, screw drill bushing KDEP 1882 into tapped hole.
Drill through bushing with 7.6 mm diameter bit.

Continue: G03/1 Fig.: G02/2

KMK03374



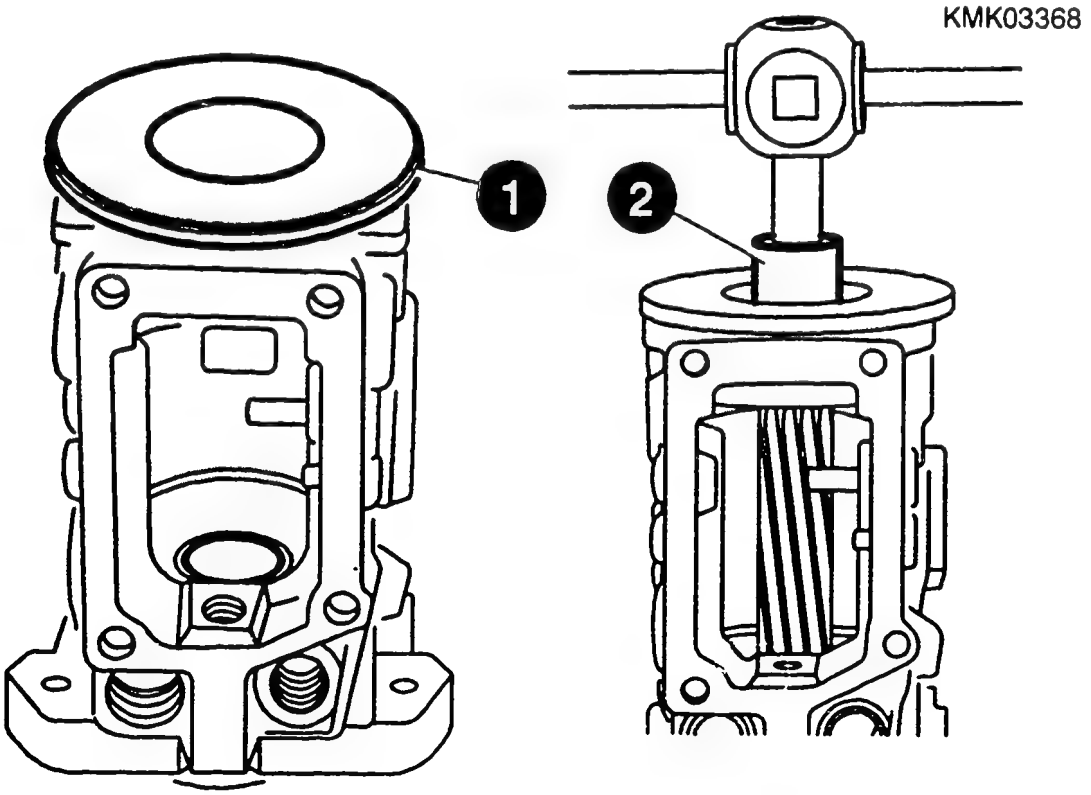
REAMING OUT BUSHINGS

1 = Support ring
2 = Guide sleeve

Place injection-pump housing flat on support plate on drive end. Insert support ring in pump housing.

Insert hand reamer in support ring. Insert guide sleeve KDEP 1171/4 in support ring (shouldered collar faces upwards).

Continue: G04/1 Fig.: G03/2



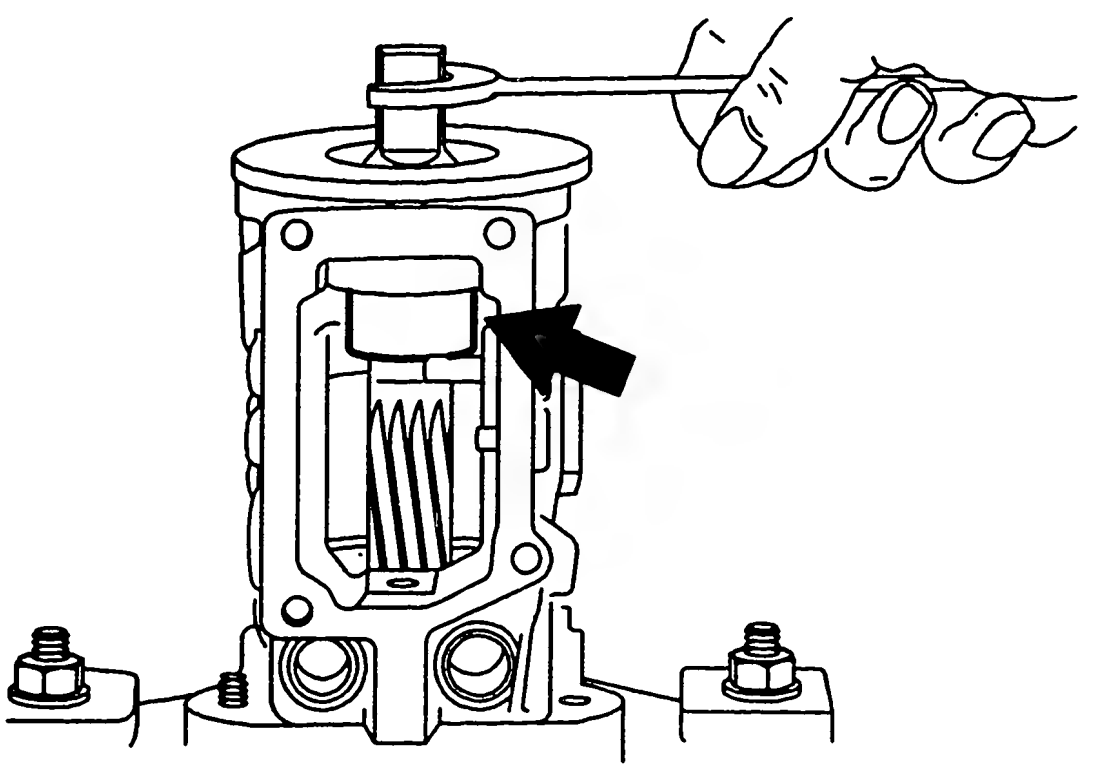
## REAMING OUT BUSHINGS

Place wrench on reamer and ream out bushing with oil.
Turn guide sleeve (shouldered collar diameter faces pump housing – arrow).

Ream out second bushing.
Ream last 2 cm with guide sleeve and open ended wrench.
Insert drive shaft and check for freedem of movement.
Make repair mark.

Continue: G05/1 Fig.: G04/2

KMK03369

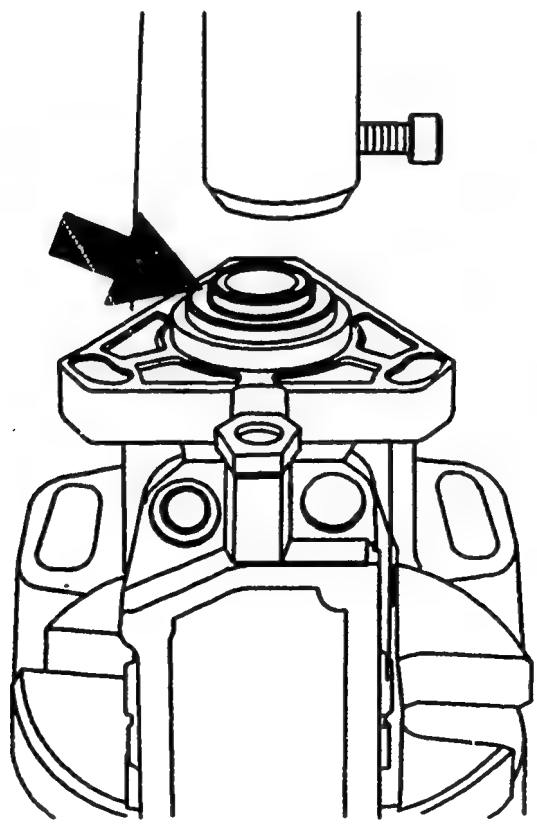


ASSEMBLING DISTRIBUTOR-TYPE
FUEL INJECTION PUMP
* Pressing in radial-lip-type oil seal

A clean workplace is required for assembly.
Apply calibrating oil to all moving parts, seal rings and O-rings prior to assembly.
Tighten all screws to prescribed tightening torque. Press radial-lip-type oil seal (arrow) into housing with mandrel press.
Attach distributor-type fuel-injection-pump housing with appropriate flange and support clamp KDEP 2919 and swivel downwards.

Continue: G06/1 Fig.: G05/2

KMK03375



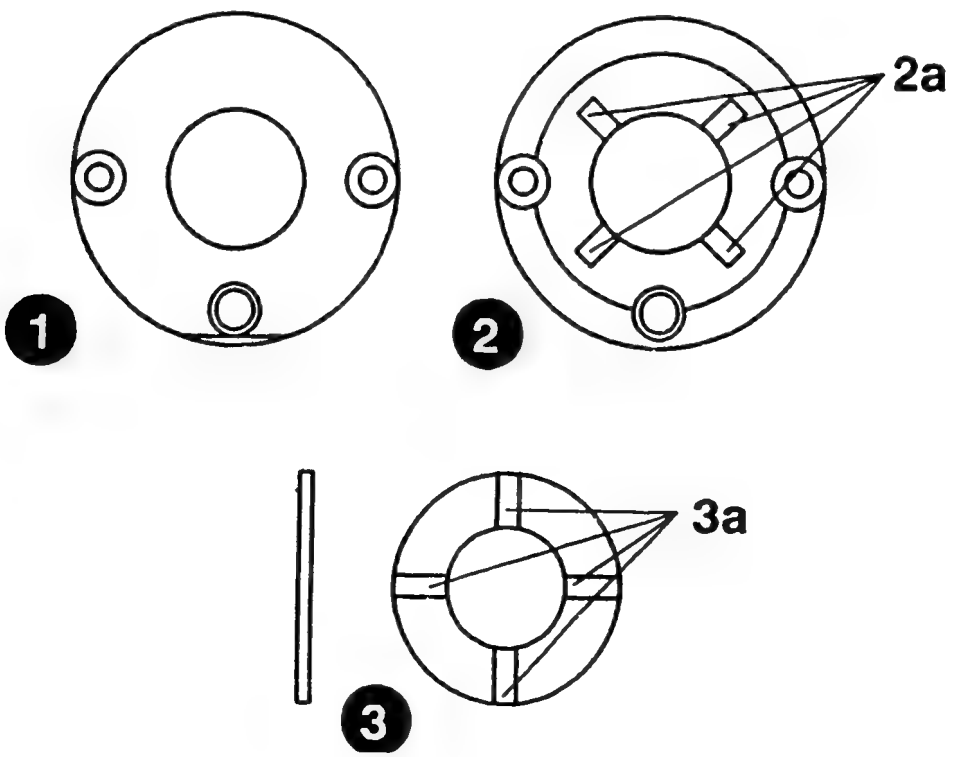
## ASSEMBLING VANE-TYPE SUPPLY PUMP

1 = Old support ring
2 = New support ring
2a = Grooves (new)
3 = Old slotted washer
3a = Grooves (no longer applicable)

As of FD 349 (date of manufacture), distributor-type fuel-injection pumps were modified in terms of slotted washer and support ring such that there are no longer any grooves in the slotted washer and such that there are grooves in the support ring instead (see picture).

Continue: G07/1 Fig.: G06/2

KMK03376



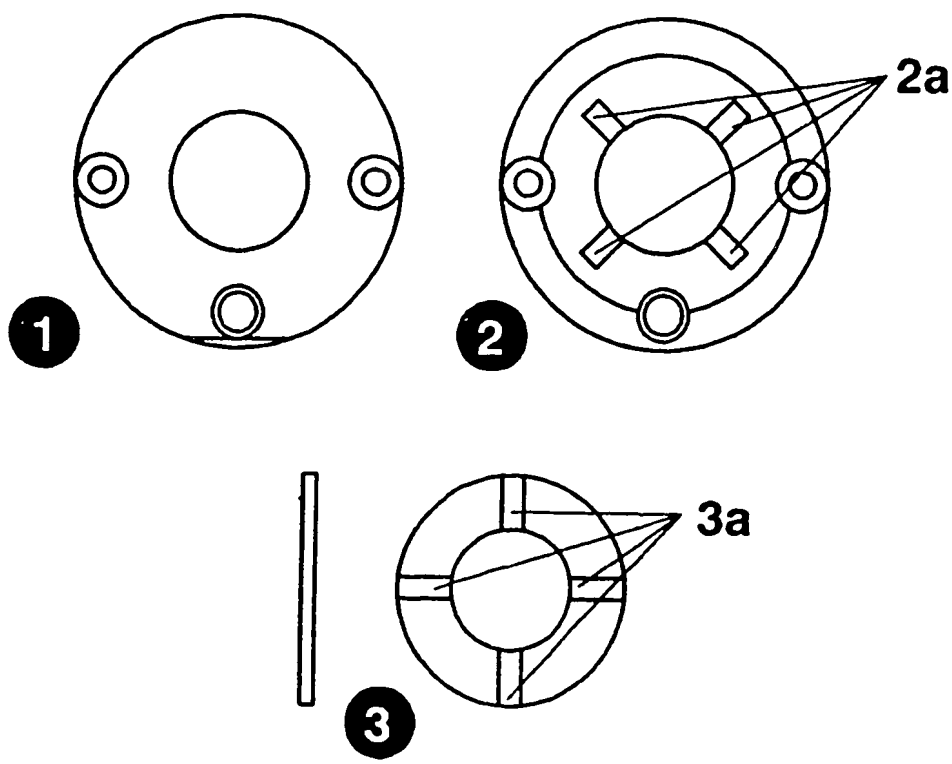
ASSEMBLING VANE-TYPE PUMP

1 = Old support ring
2 = New support ring
2a = Grooves (new)
3 = Old slotted washer
3a = Grooves (no longer applicable)

Assembly of the support ring with grooves (new) with a slotted washer with grooves (old) is possible, however not assembly of a support ring with no grooves (old) with a slotted washer with no grooves (new).

Continue: G08/1 Fig.: G07/2

KMK03376



## ASSEMBLING VANE-TYPE SUPPLY PUMP

1 = Holding ring
2 = Slotted washer with pump vane

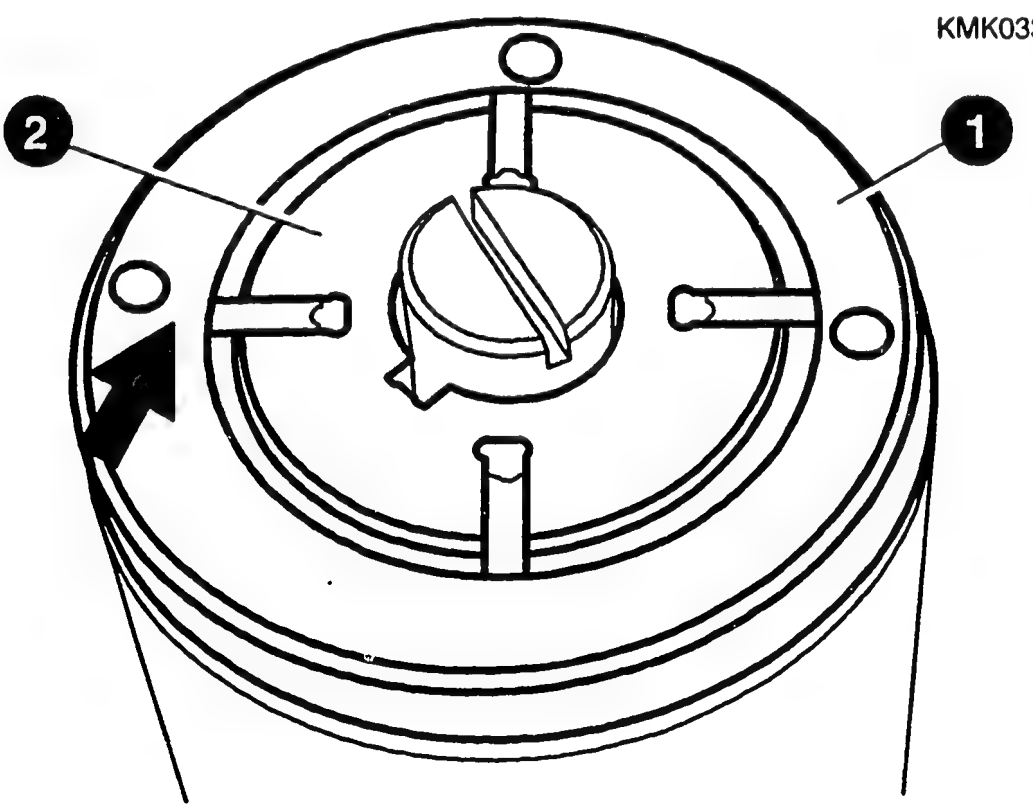
Position support ring with slotted washer and pump vane on assembly tool KDEP 1097 with holding mandrel.

Insert pump vane such that crowned surface faces outwards (arrow).

Place holding ring (eccentric ring) on supporting plate.

Continue: G09/1 Fig.: G08/2

KMK03377

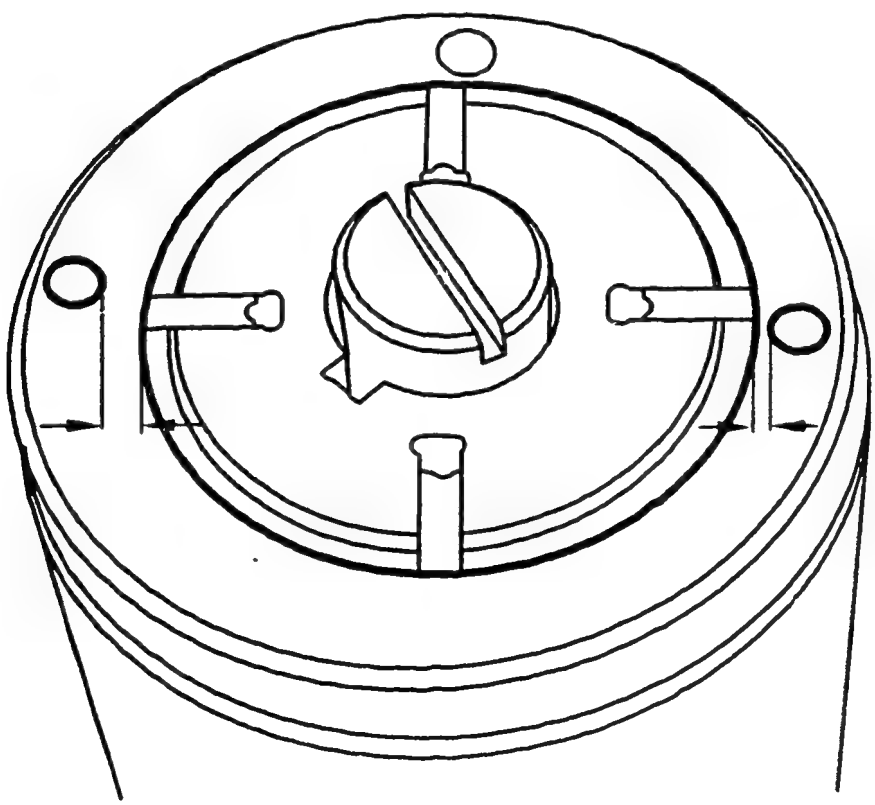


## ASSEMBLING VANE-TYPE SUPPLY PUMP

The two opposing holes in the holding ring are a different distance from the bearing surface of the pump vanes. As characteristic feature of the installation of the holding ring, attention is to be paid to the hole further away from the bearing surface.

Continue: G10/1 Fig.: G09/2

KMK03378

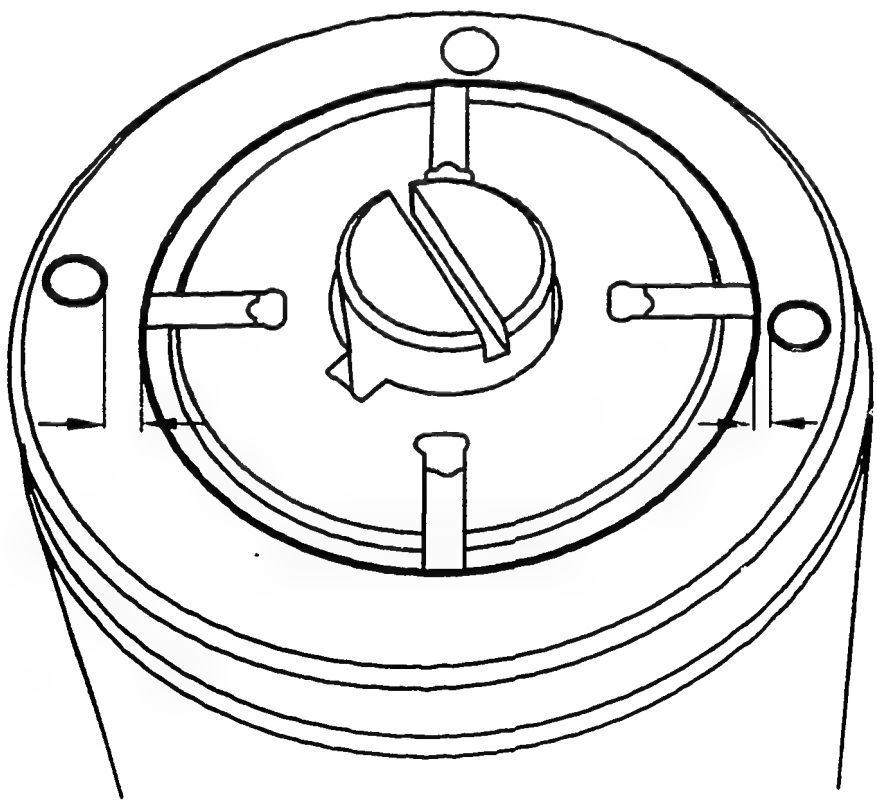


## ASSEMBLING VANE-TYPE SUPPLY PUMP

If the direction of rotation of the fuel-injection pump is given as "L", this hole must be on the left when looking towards the assembly tool and on the right if "R" is given as direction of rotation.

Continue: G11/1 Fig.: G10/2

KMK03378

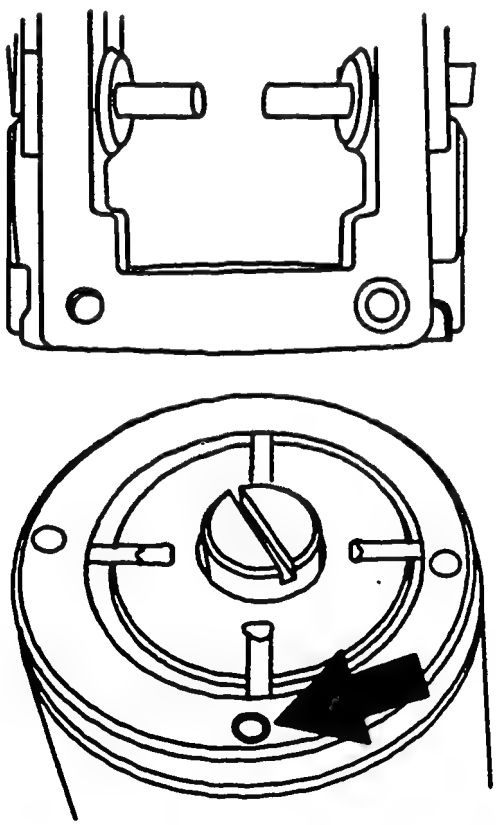


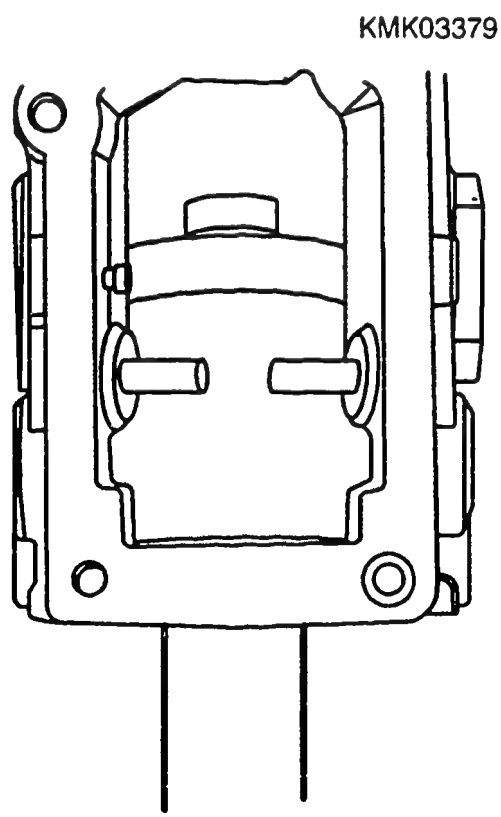
## ASSEMBLING VANE-TYPE SUPPLY PUMP

The center hole (arrow) must always face upwards towards the governor in the pump housing.

Insert supply pump with assembly tool KDEP 1097 from underneath into pump housing. Leave assembly tool in position.

Continue: G12/1 Fig.: G11/2





## ASSEMBLING VANE-TYPE SUPPLY PUMP

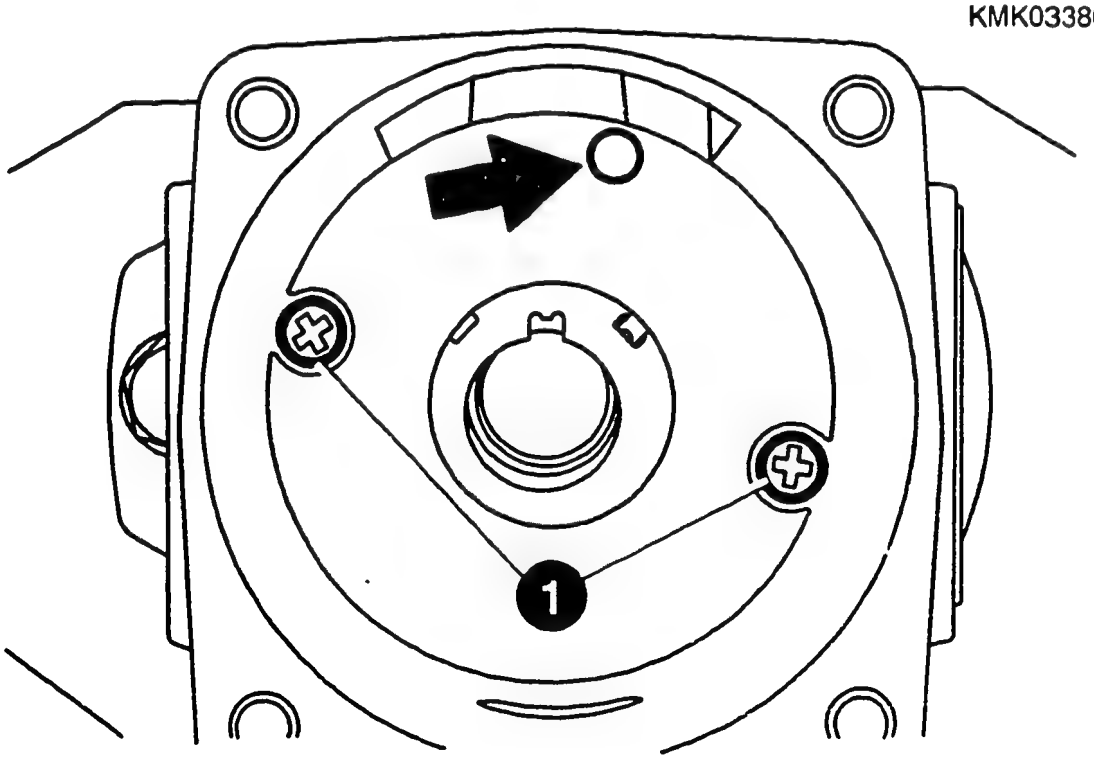
1 = Countersunk screws

Swivel pump housing upwards through 180° and pull out assembly tool.

Before securing support ring with countersunk screws, check whether all three holes coincide with the eccentric ring and whether the center hole (arrow) is pointing upwards towards the governor.

Continue: G13/1 Fig.: G12/2

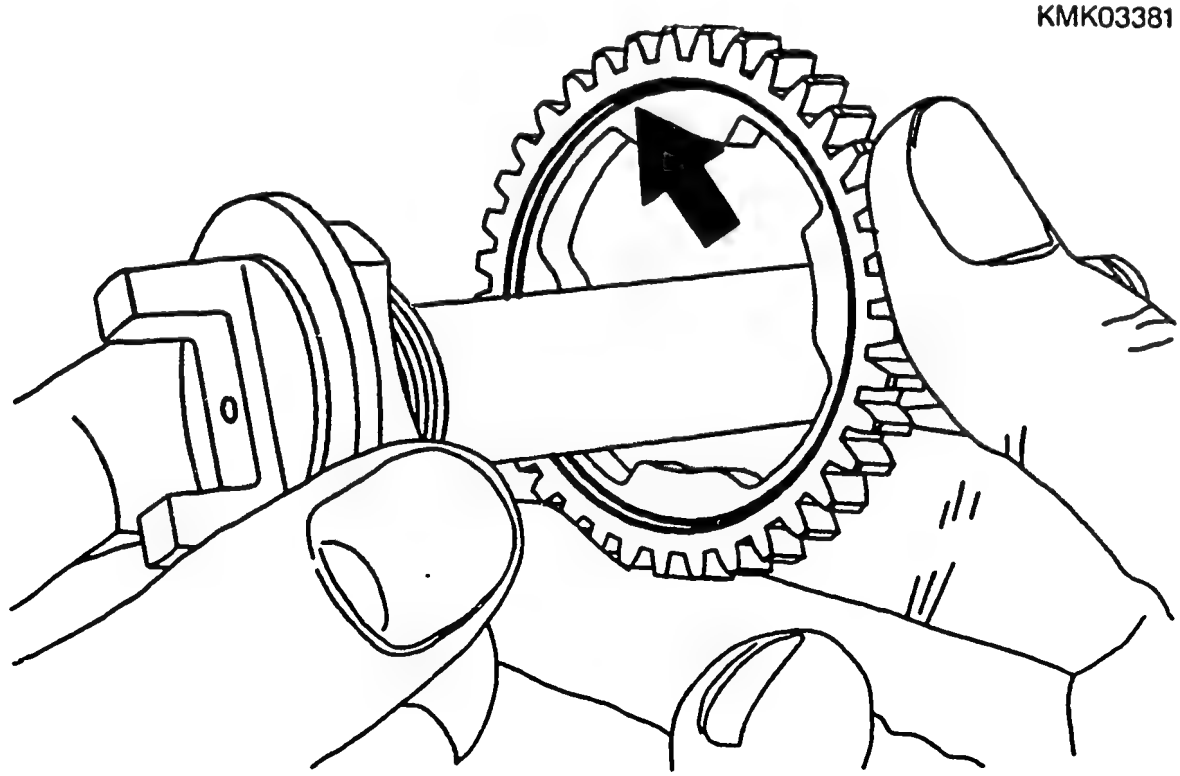
KMK03380



## INSTALLING DRIVE SHAFT

Slip gear wheel onto drive shaft such that recess in gear wheel points towards claws of drive shaft (arrow).
Press new rubber buffers by hand into gear wheel.
Stick slotted washer to drive shaft with grease.
Insert Woodruff key in drive shaft.

Continue: G14/1 Fig.: G13/2



## ASSEMBLING DRIVE SHAFT; INSERTING STEEL RINGS AND SHAFT IN PUMP HOUSING

Position pump housing such that it is horizontal.

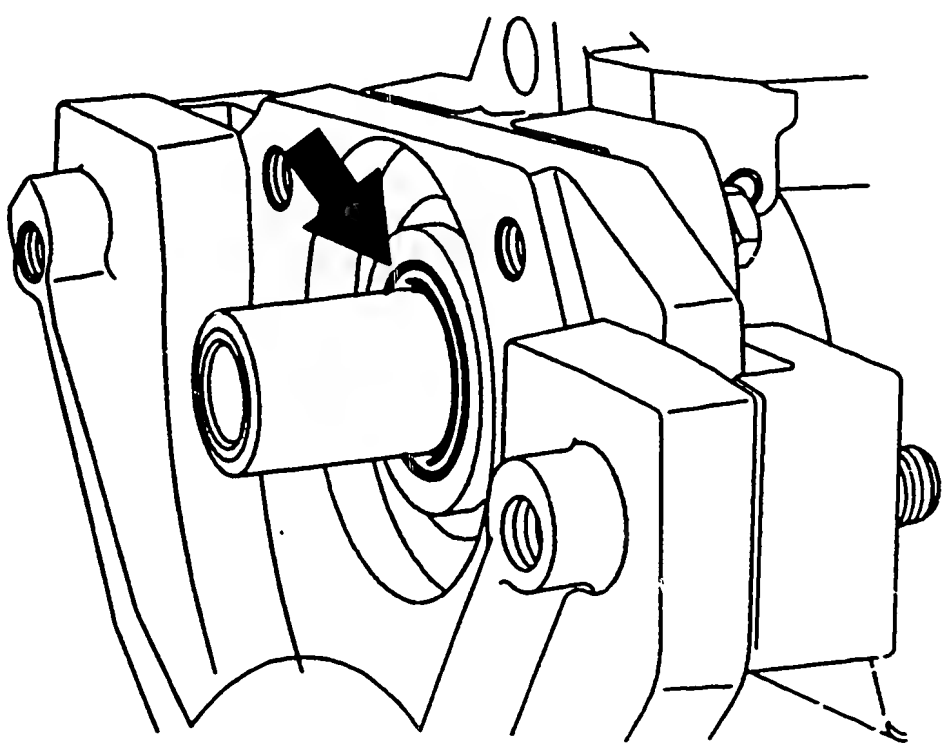
Attach assembly sleeve to protect radial-lip-type oil seal.

Insert preassembled drive shaft into pump housing such that Woodruff key engages in groove of impeller.

Position pump housing such that it is perpendicular.

Continue: G15/1 Fig.: G14/2

KMK03382



## INSERTING CAM ROLLER RING IN PUMP HOUSING

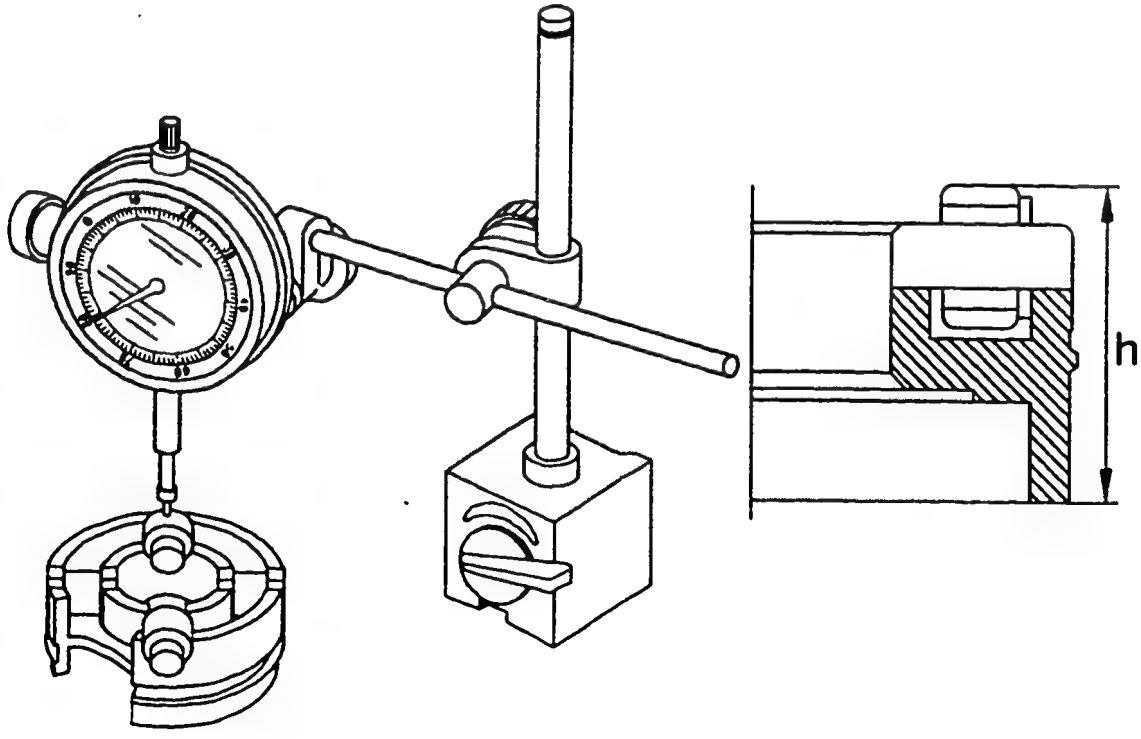
Rollers of cam roller ring must not drop out or be mixed up.

If this is the case, the roller height must be re-measured.

Maximum difference between the individual roller heights 0.02 mm.

Continue: G16/1 Fig.: G15/2

KMK03383



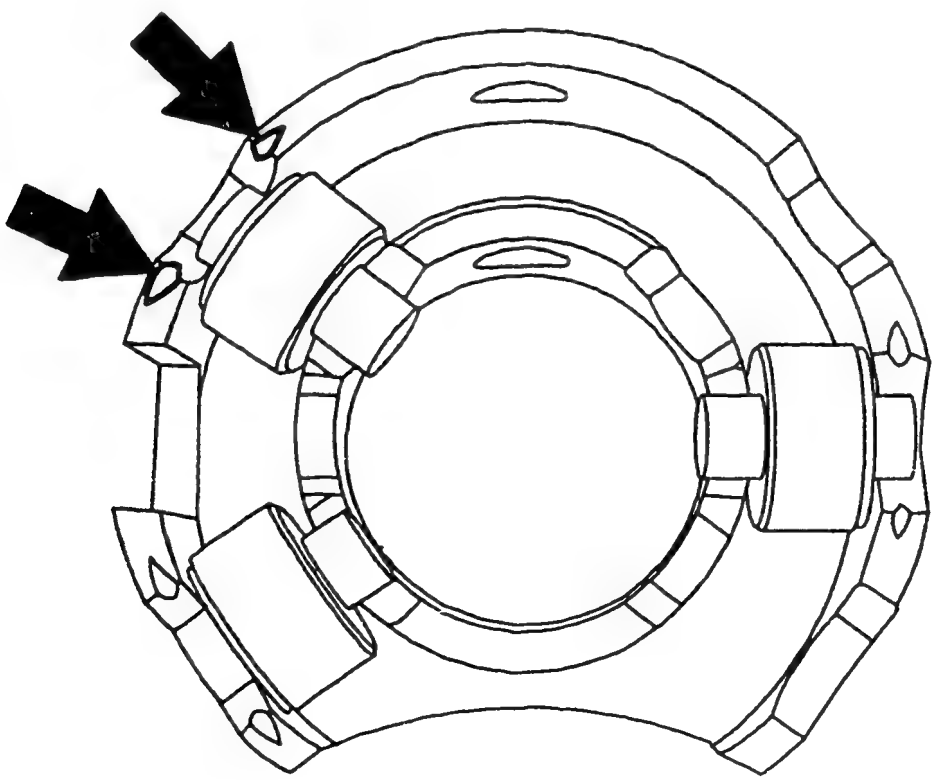
## INSERTING CAM ROLLER RING IN PUMP HOUSING

Attention is to be paid to the installation of the rollers in the case of cam roller rings with 3 rollers. The bearing grooves into which one roller is to be inserted in each case are marked by way of notches (arrows) on the end face of the cam roller ring.

The other bearing grooves are not used.

Continue: G17/1 Fig.: G16/2

KMK03384

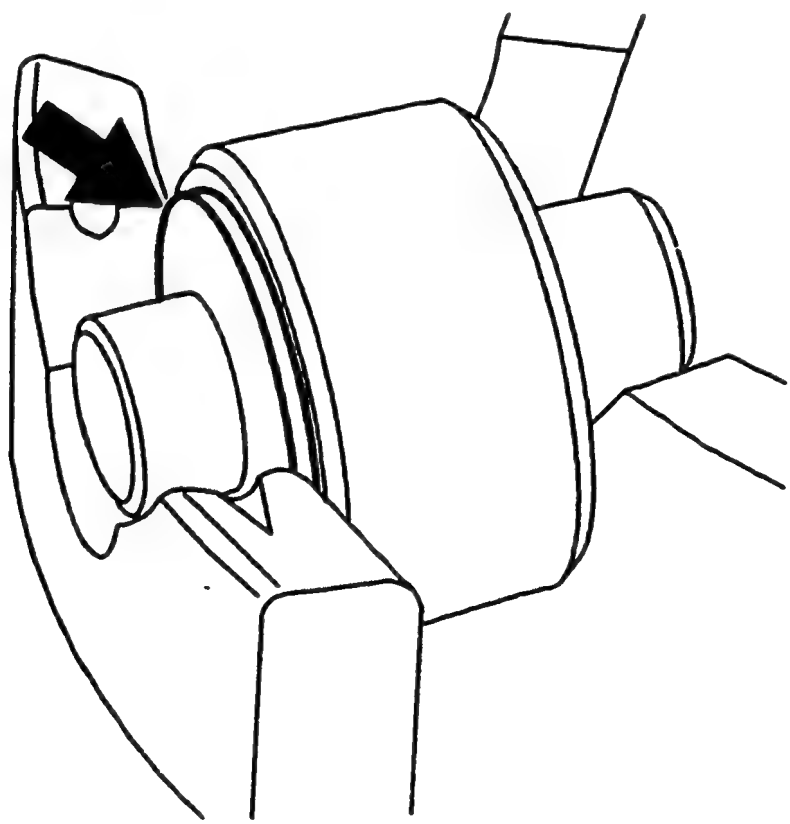


INSERTING CAM ROLLER RING IN PUMP HOUSING

NOTE:
When fitting rollers, make sure that spring seats are installed on outside of rollers (arrow).

The tapered side must point towards the outer ring.

Continue: G18/1 Fig.: G17/2



KMK03385

## INSERTING CAM ROLLER RING IN PUMP HOUSING

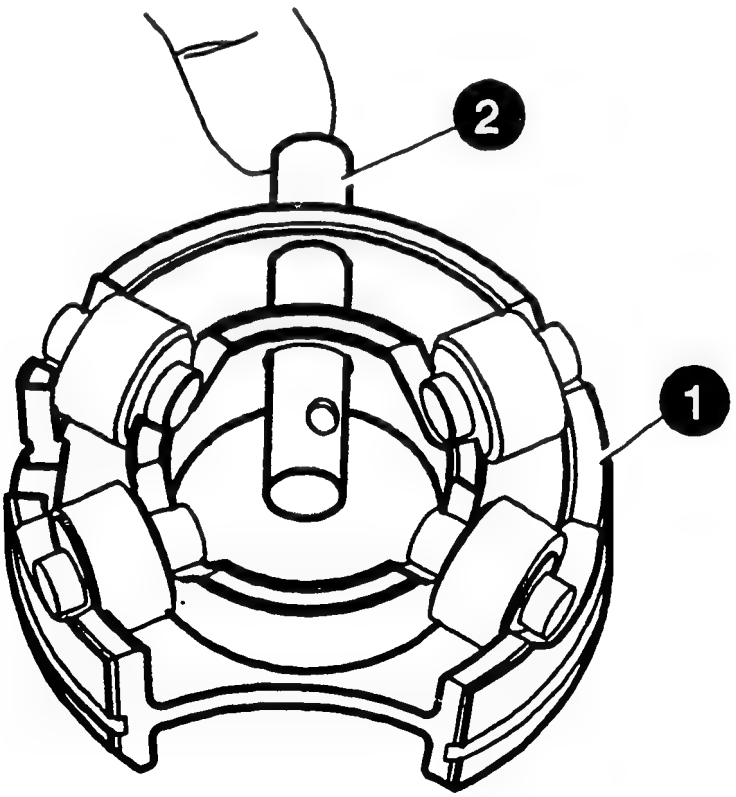
1 = Cam roller ring
2 = Sliding bolt

Push sliding bolt completely into cam roller ring cross-bore first. Position cross-bore such that it is vertical.

Position claws of drive shaft in parallel with timing device.

Continue: G19/1 Fig.: G18/2

KMK03386

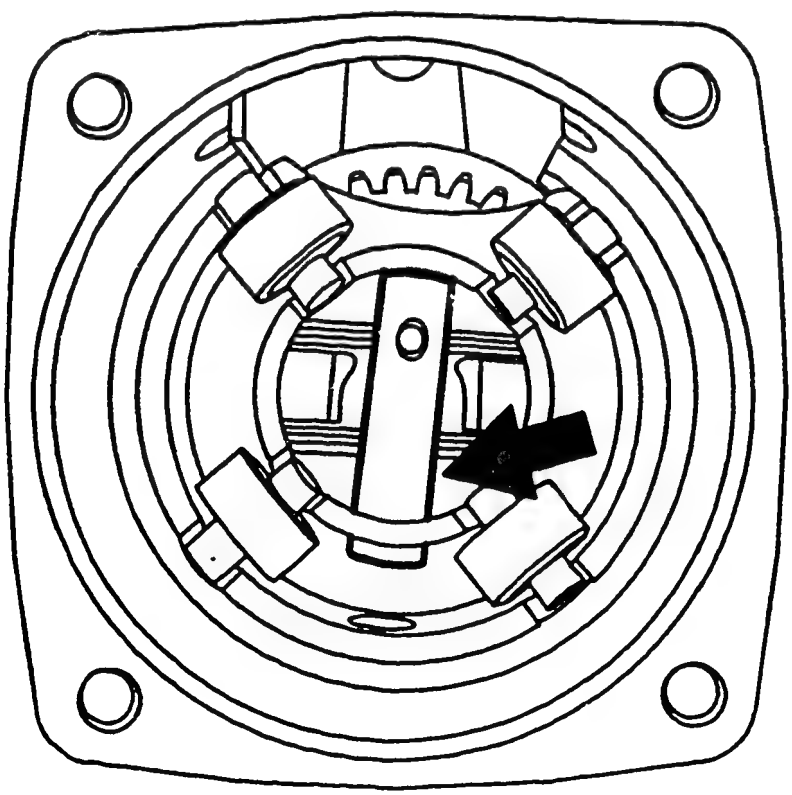


## INSERTING CAM ROLLER RING IN PUMP HOUSING

Insert cam roller ring in pump housing such that sliding bolt (arrow) faces timing device.

Continue: G20/1 Fig.: G19/2

KMK03387

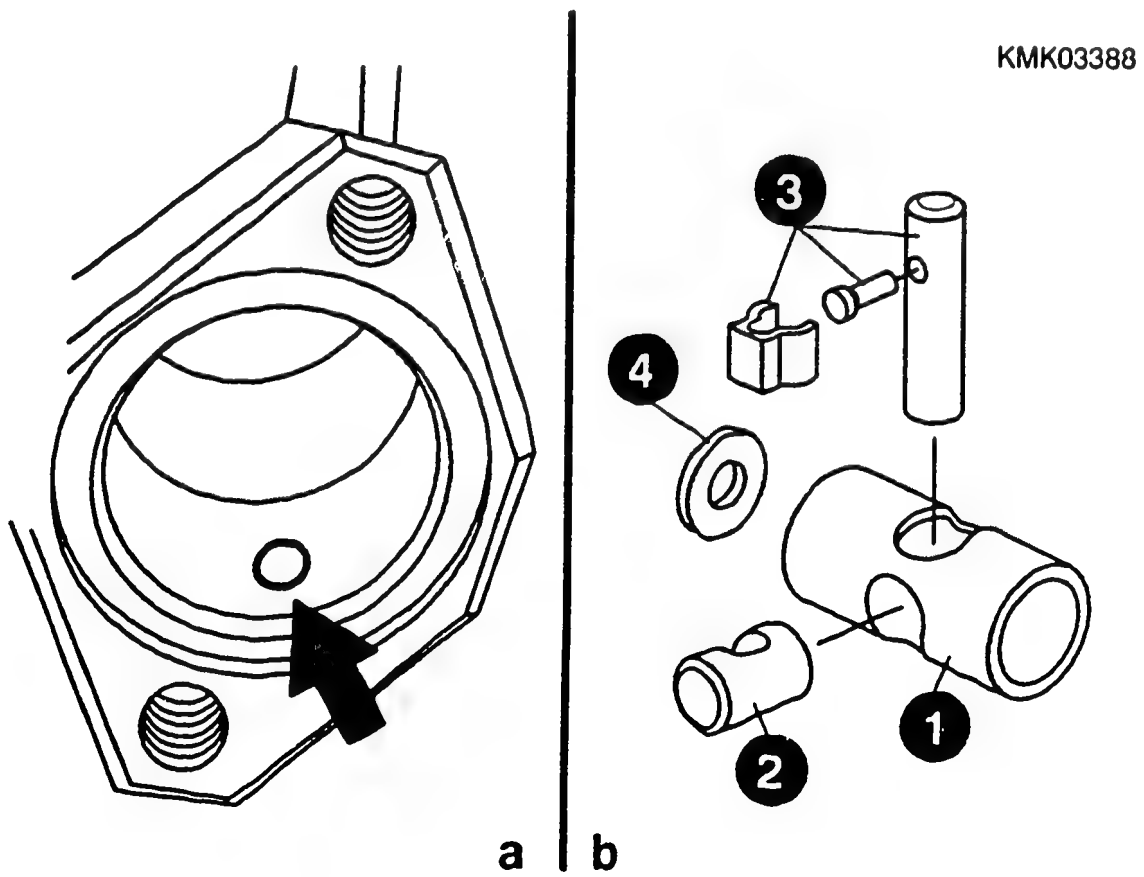


## INSERTING TIMING-DEVICE PISTON

1 = Timing-device piston
2 = Sliding piece
3 = Sliding bolt with retaining pin and retaining bracket
4 = Shim

Insert sliding piece and shim in timing-device piston with grease. Slip timing-device piston into pump housing such that open side for compression spring faces return bore (arrow).

Continue: G21/1 Fig.: G20/2



## INSERTING TIMING-DEVICE PISTON

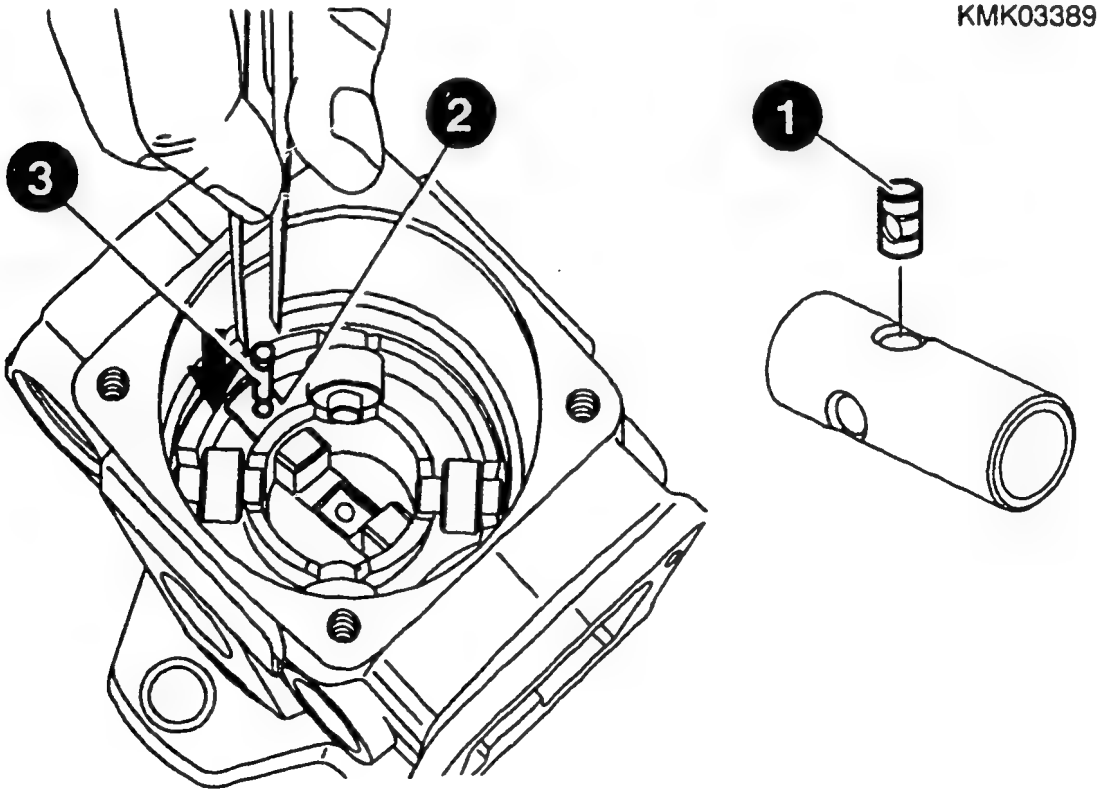
1 = Sliding piece
2 = Sliding bolt
3 = Retaining pin

The hole in the sliding piece faces the cam roller ring.

Insert sliding bolt into sliding piece of timing-device piston and secure with retaining pin.

Continue: G22/1 Fig.: G21/2

KMK03389



## INSERTING TIMING-DEVICE PISTON

1 = Retaining bracket

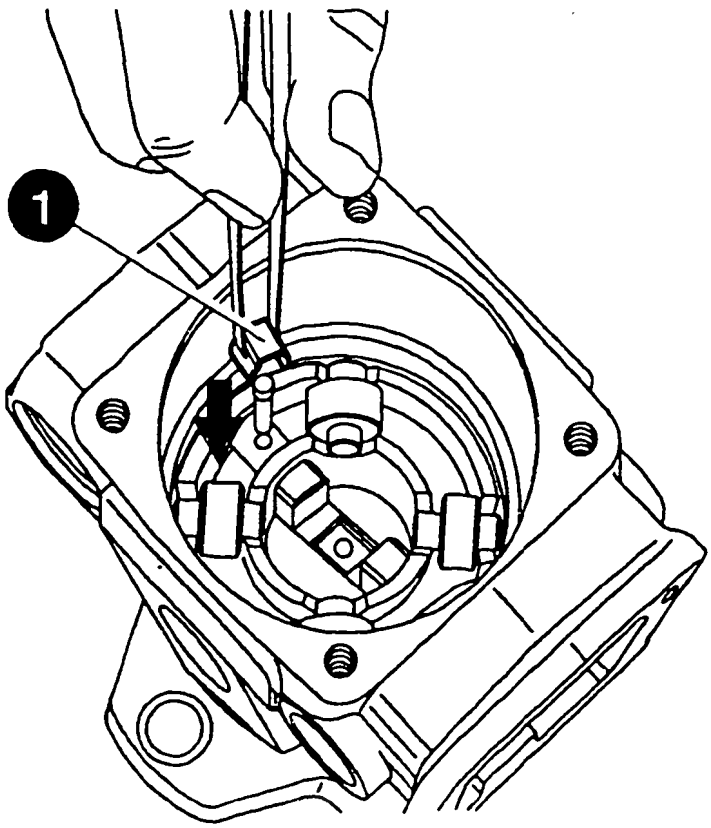
Attach retaining bracket to retaining pin. Check freedom of movement of timing device!

Install timing-device cover with seal ring.

Note:
The timing-device travel is determined by the length of the piston and does not have to be calibrated.

Continue: G23/1 Fig.: G22/2

KMK03390



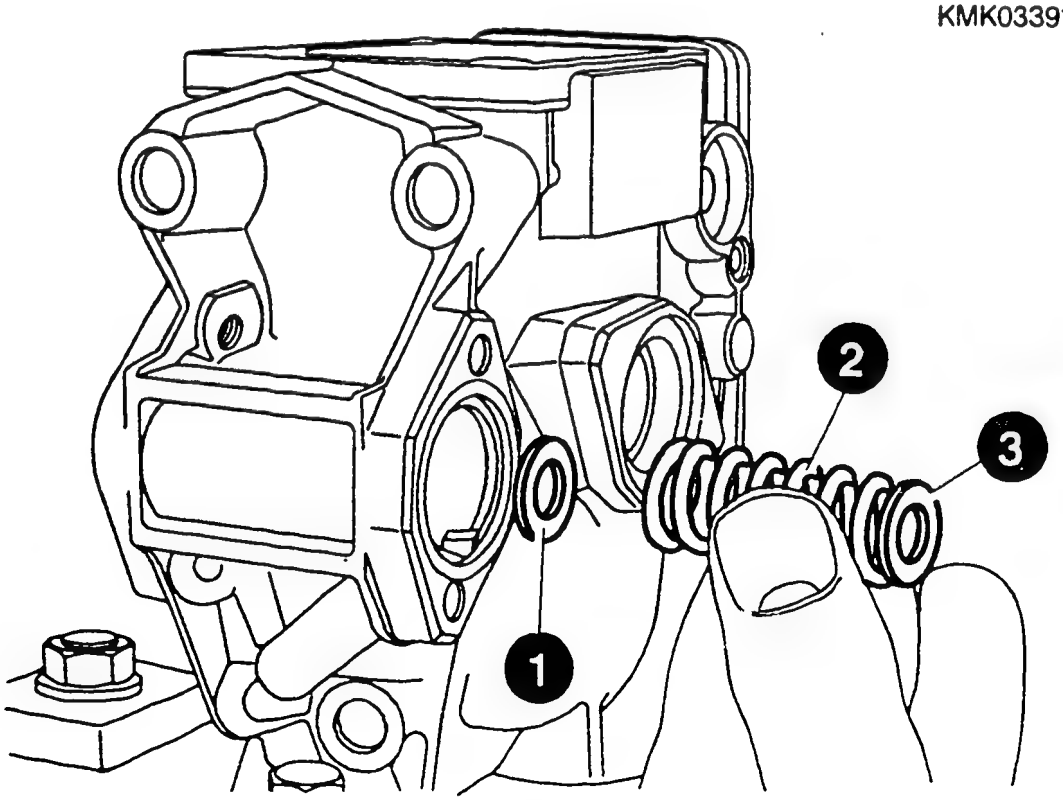
## CHECKING AND ADJUSTING TIMING-DEVICE SHIM THICKNESS "SVS"

1 = Shim
2 = Compression spring
3 = Shim

Measure thickness of shims (comprising items 1 and 3). Allowance must always be made for the shim plate in the timing-device piston. Compare to data given in corresponding test-specification sheet under "SVS". Add or remove shims if necessary.

Continue: G24/1 Fig.: G23/2

KMK03391



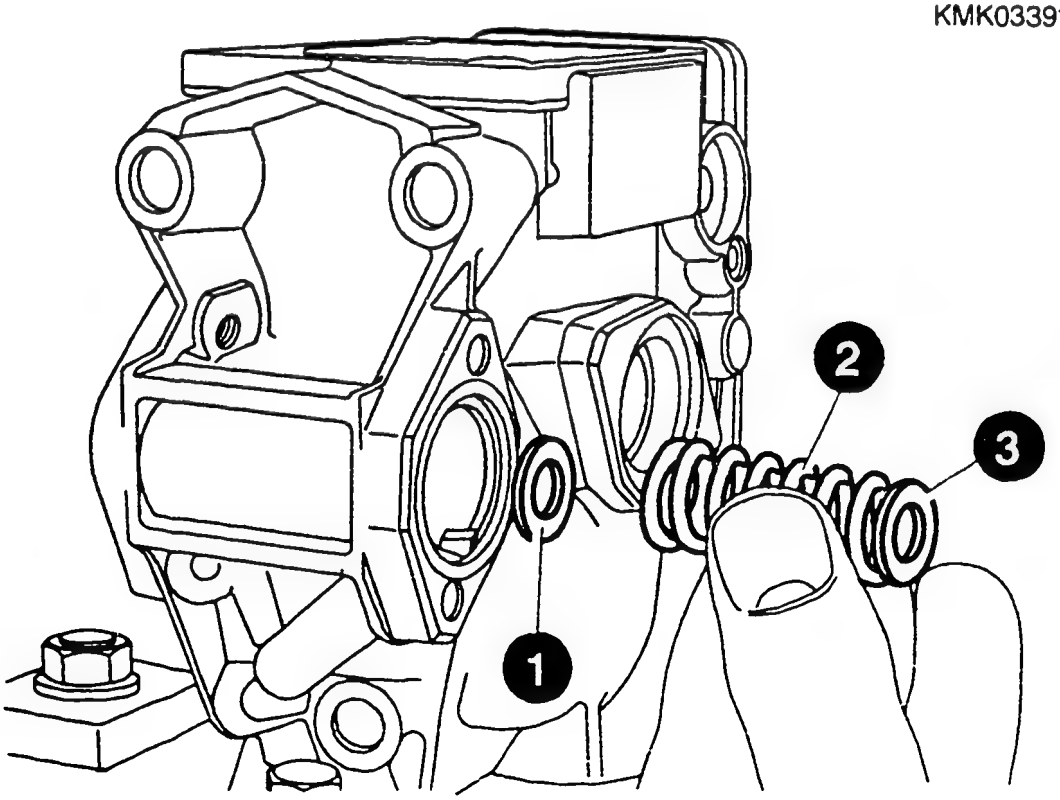
## CHECKING AND ADJUSTING TIMING-DEVICE SHIM THICKNESS "SVS"

Insert approx. 0.6 mm thick shim in timing-device piston. Install compression spring; insert seal ring and fit closing cover with remaining shims of dimension "SVS".

Note:
There must be at least one shim on either side of the compression spring (max. 3 mm thick).
"SVS" is the maximum dimension.

Continue: G25/1 Fig.: G24/2

KMK03391



INSTALLING COLD START ACCELERATION DEVICE KSB

Select further assembly in line with following add-on modules:

* Attaching mechanical cold start acceleration device (KSB) Version with no detent position G26/1
* Version with detent position H06/1

* Attaching hydraulic KSB H09/1

* Attaching temperature-controlled KSB H11/1

* Pump with no KSB H17/1

Continue: G26/1

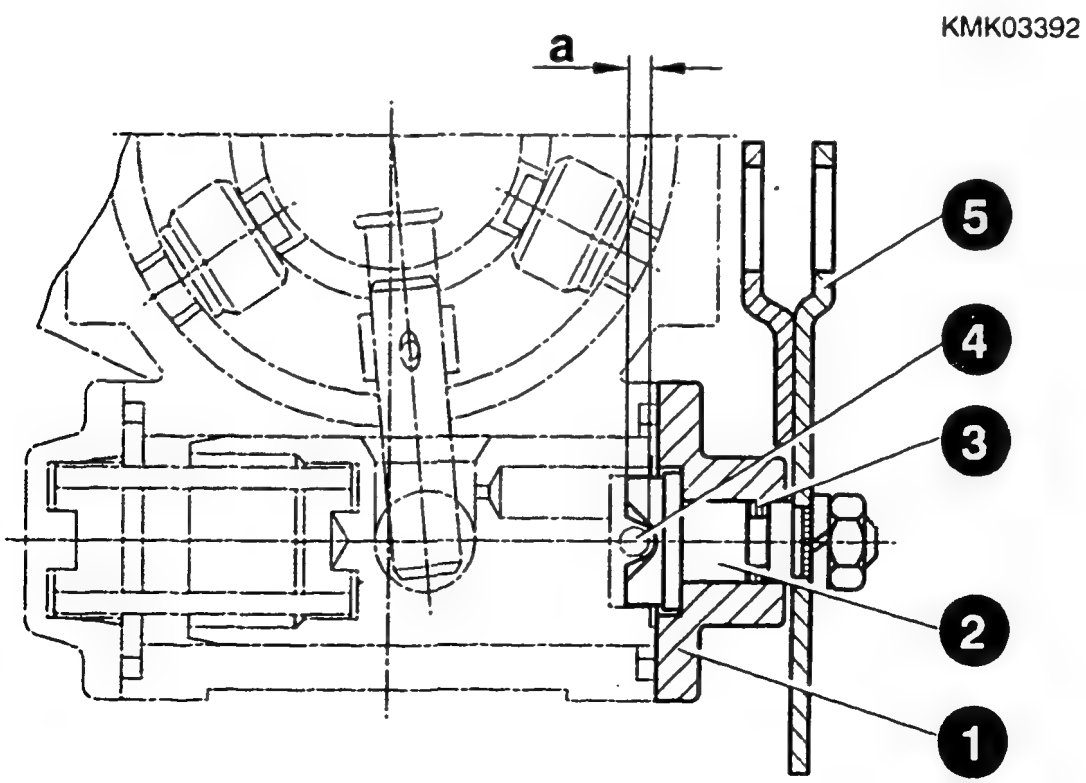
## ATTACHING MECHANICAL COLD START ACCELERATION DEVICE (KSB)

a = Function stroke
1 = Closing cover
2 = Shaft
3 = O-ring
4 = 4 mm pin at timing-device piston
5 = Stop lever

If applicable, fit KSB on delivery end of timing device.

Install shaft with O-ring in closing cover.

Continue: G27/1 Fig.: G26/2



ATTACHING MECHANICAL COLD START ACCELERATION DEVICE (KSB)

1 = Stop plate

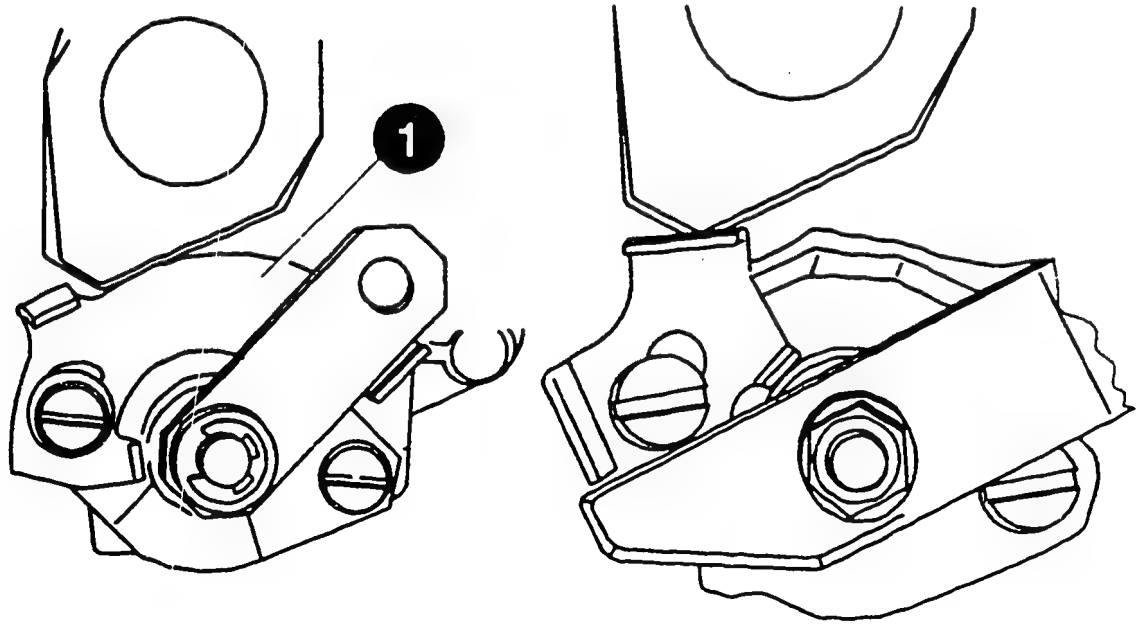
Attach closing cover to pump housing (timing device ) with stop plate depending on version.

Picture, left : Version 1
Picture, right: Version 2

Perform basic setting of stop lever.

Continue: G28/1 Fig.: G27/2

KMK03393



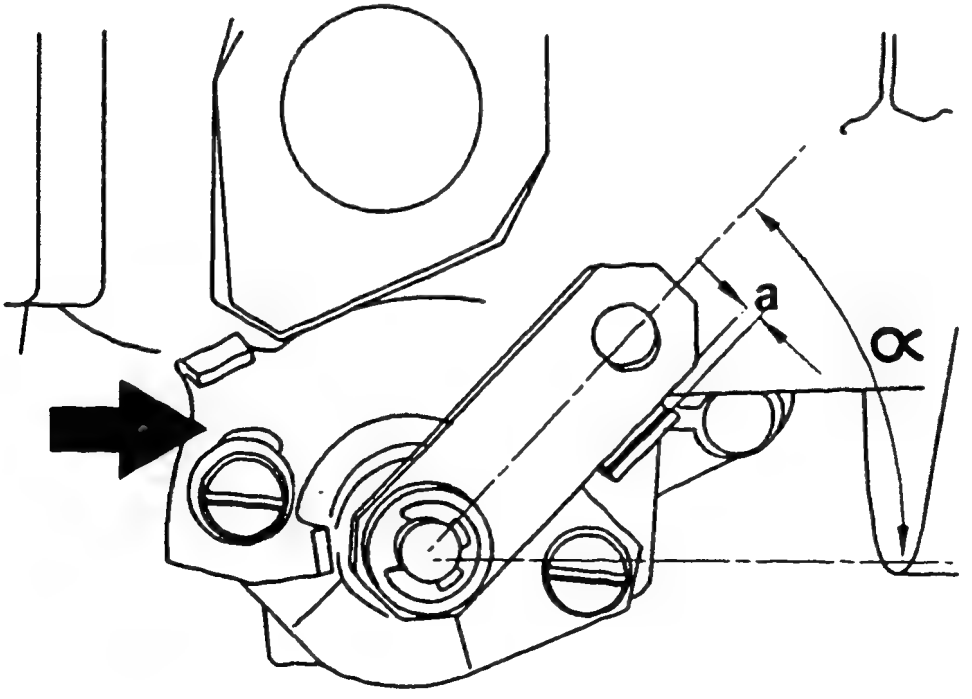
## BASIC SETTING OF STOP LEVER

* Version 1

Turn KSB shaft by hand in adjustment direction until cam makes noticeable contact with 4 mm pin of timing-device piston.
Install stop lever at angle alpha in correct position in adjustment direction. Angle is given in test-specification sheet.
Adjust stop plate in this lever position to 1 mm clearance (a).

Continue: H01/1 Fig.: G28/2

KMK03394



## BASIC SETTING OF STOP LEVER

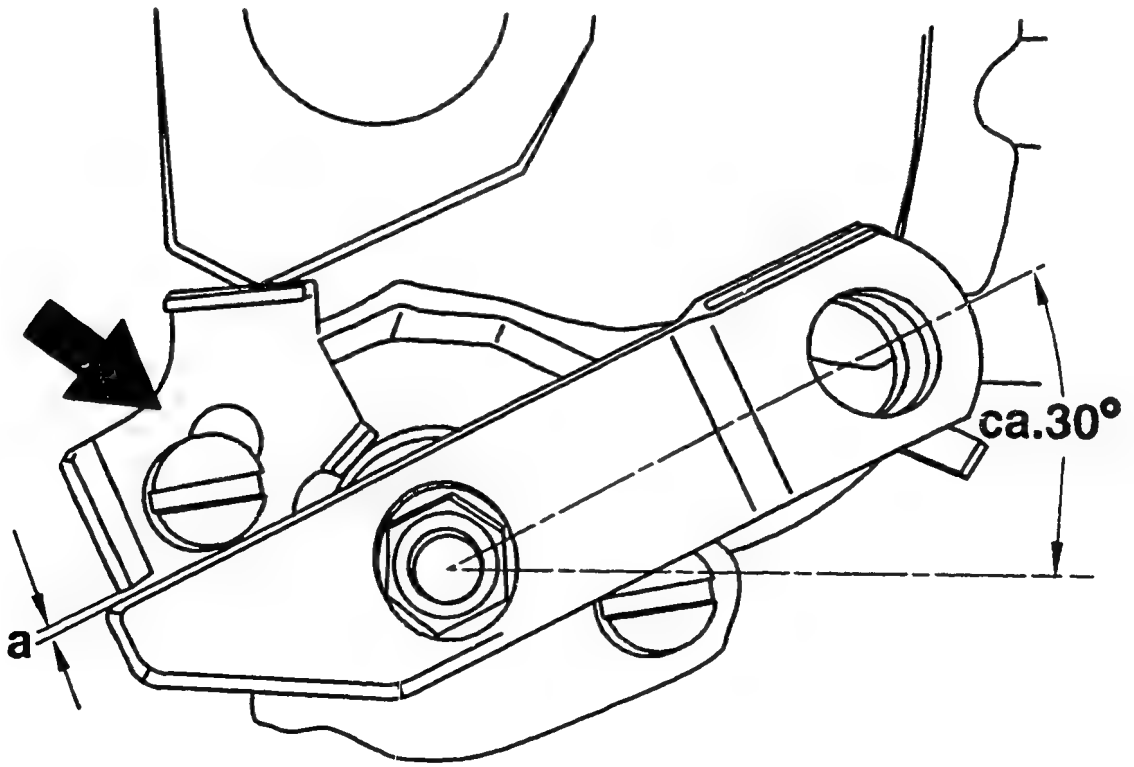
* Version 2

Turn KSB shaft by hand in adjustment direction until cam makes noticeable contact with 4 mm pin of timing-device piston.
Set stop plate to 1 mm clearance (a).
Position of stop lever = 30°.

Note:
Pay attention to correct installation position when fitting stop lever!

Continue: H02/1 Fig.: H01/2

KMK03395



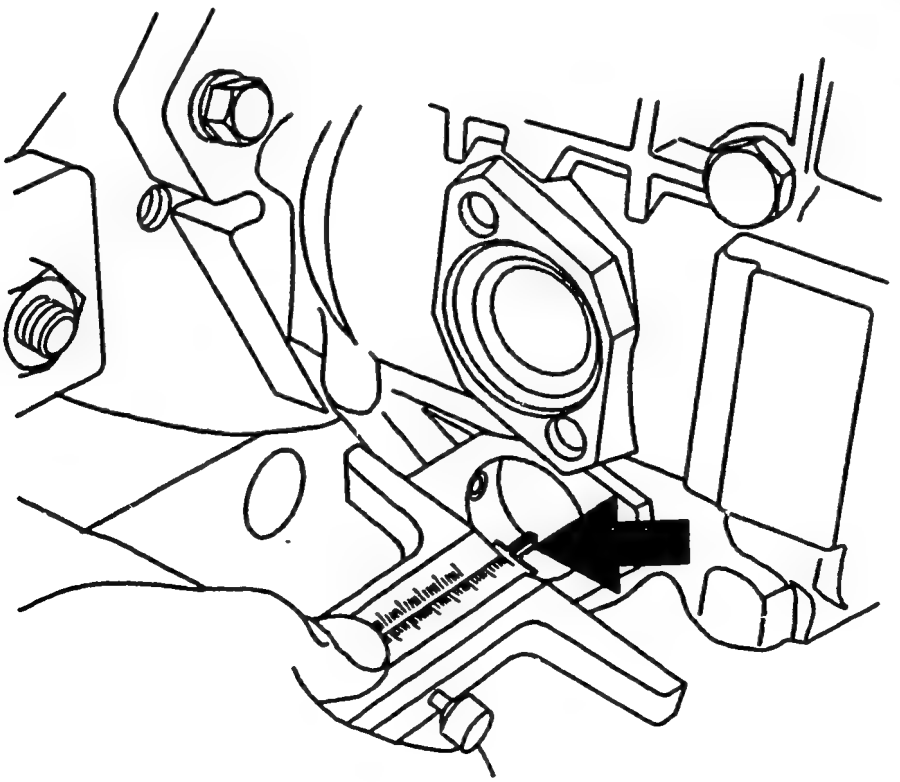
## MEASURING FUNCTION STROKE

Disassemble complete cover on spring side of timing device.
Remove spring and seal ring.
Set KSB cam to UT position by turning stop lever; at the same time, press timing-device piston against cam on spring end.

Use depth gauge to measure distance between housing and timing-device piston (arrow, dimension 1).

Continue: H03/1 Fig.: H02/2

KMK03396



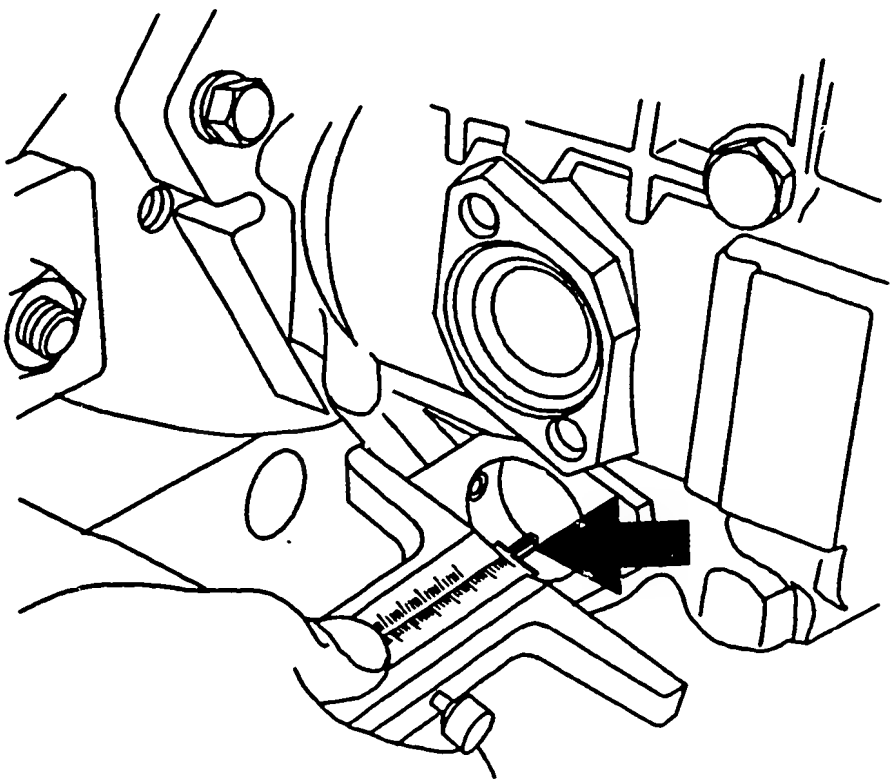
## MEASURING FUNCTION STROKE

Move cam by way of stop lever to OT position; in doing so press timing-device piston against cam again.

Re-measure distance between housing and timing-device piston (arrow, dimension 2).
Difference between dimensions 1 and 2 gives function stroke (refer to test-specification sheet).

Continue: H04/1 Fig.: H03/2

KMK03396



## MEASURING FUNCTION STROKE

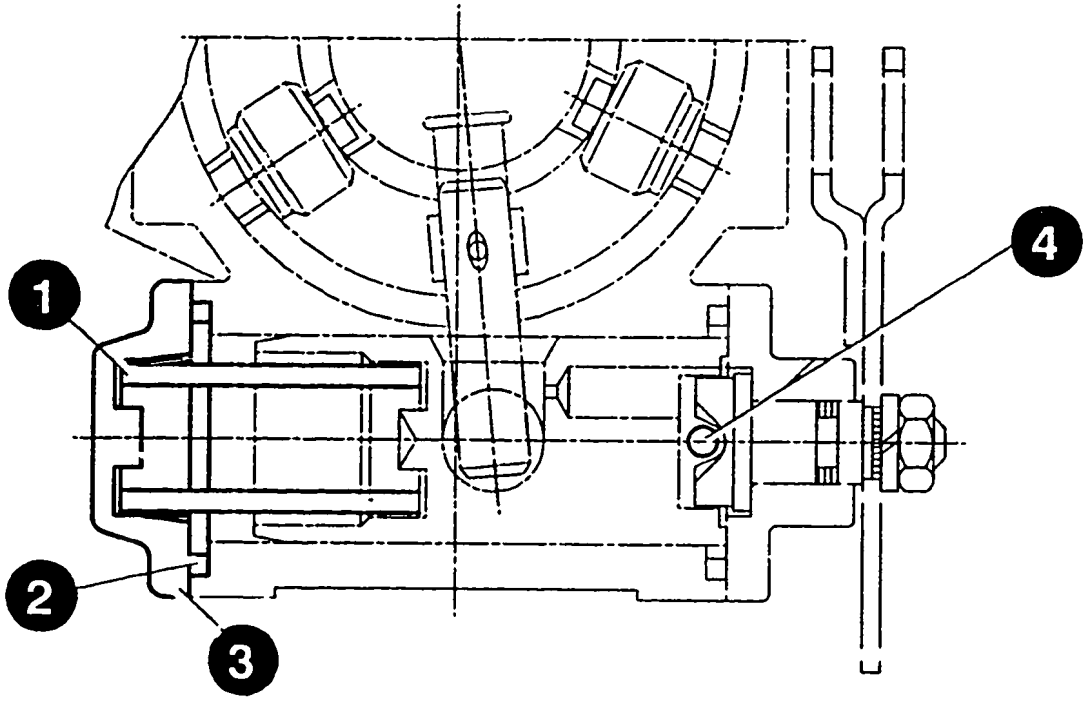
1 = Timing-device spring
2 = Seal ring
3 = Timing-device cover
4 = Pin

Fit spring, seal ring and timing-device cover.

Loosen fastening screws of KSB cover by half a turn.
Turn stop lever in adjustment direction until shortly prior to OT position of KSB. This operation is of importance as regards centering of the cam with respect to the 4 mm pin in the timing-device piston.

Continue: H05/1 Fig.: H04/2

KMK03397



## MEASURING FUNCTION STROKE

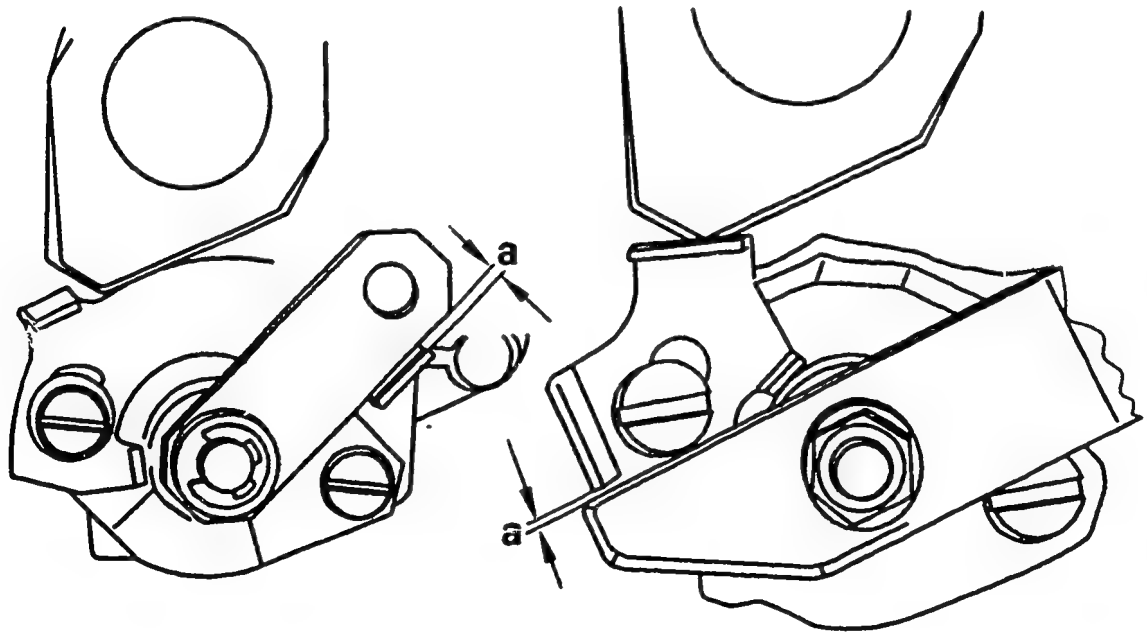
Tighten both fastening screws of cover to tightening torque 6...9 Nm . Move stop lever to initial position (UT).
Loosen fastening screw of stop plate by half a turn.
Operate stop lever as far as start of timing-device stroke.

Set stop plate in this lever position to 1 mm clearance (picture, a) before start of timing-device stroke.

Picture, left : Version 1
Picture, right: Version 2

Continue: H17/1 Fig.: H05/2

KMK03398



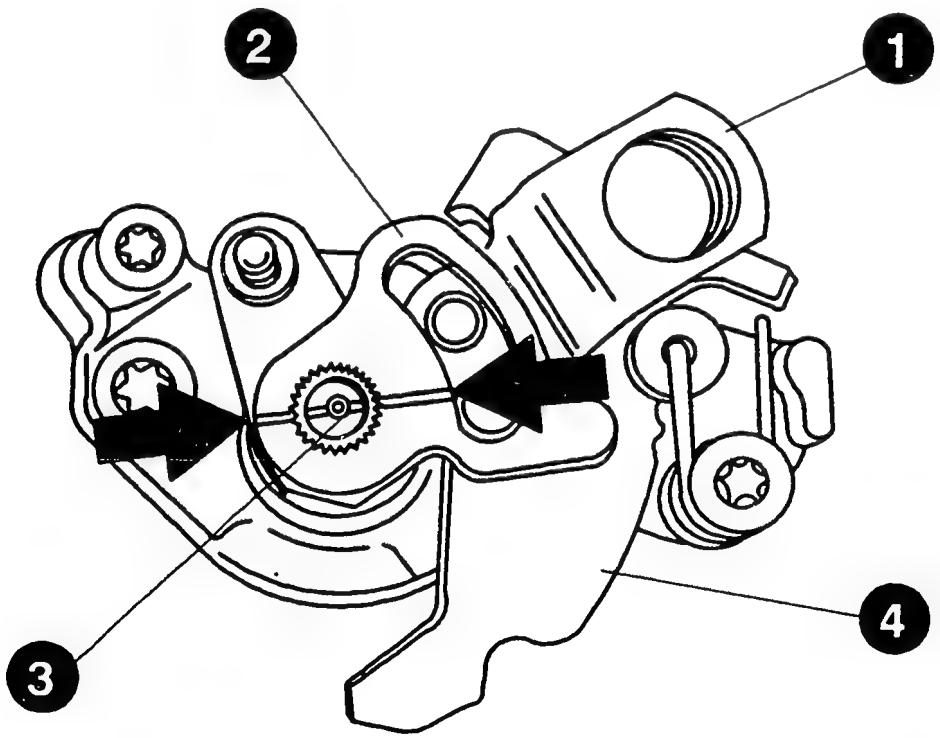
ATTACHING MECHANICAL COLD START ACCELERATION DEVICE (KSB)

* Version with detent position

1 = KSB control lever
2 = Basic lever
3 = Lever shaft
4 = Bell crank

Place KSB control lever on lever shaft and position bell crank against housing stop (housing stop not visible in picture).
Place basic lever with mark on lever shaft toothing such that both marks coincide (arrows).

Continue: H07/1 Fig.: H06/2




KMK02985

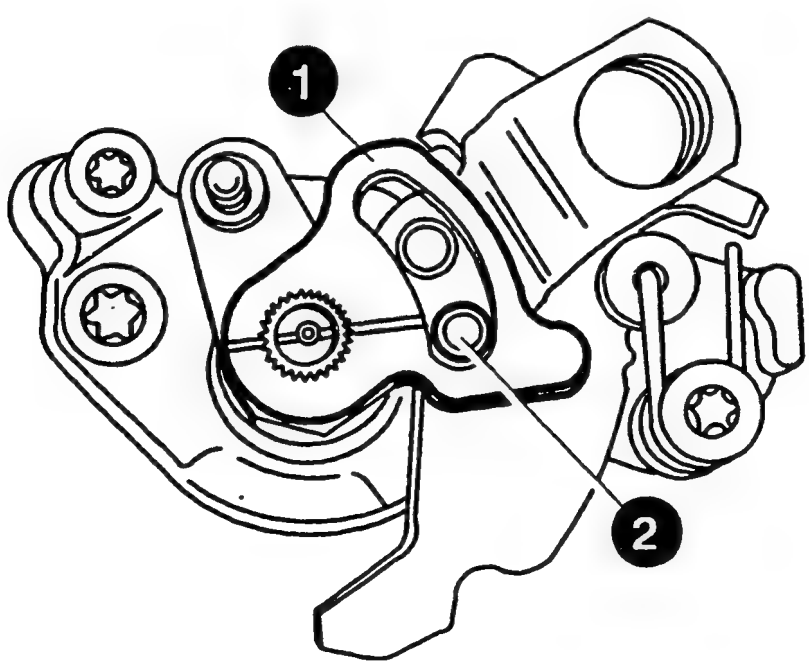
ATTACHING MECHANICAL COLD START ACCELERATION DEVICE (KSB)
* Version with detent position

1 = Basic lever
2 = Tapped hole

Turn basic lever until tapped hole makes contact with end of slot.
Screw in fillister-head screw (do not tighten).
Place spring washer and plain washer on lever shaft.
Press down plain washer and fit lock washer.

Continue: H08/1 Fig.: H07/2

KMK03400



ATTACHING MECHANICAL COLD START ACCELERATION DEVICE (KSB)
* Version with detent position

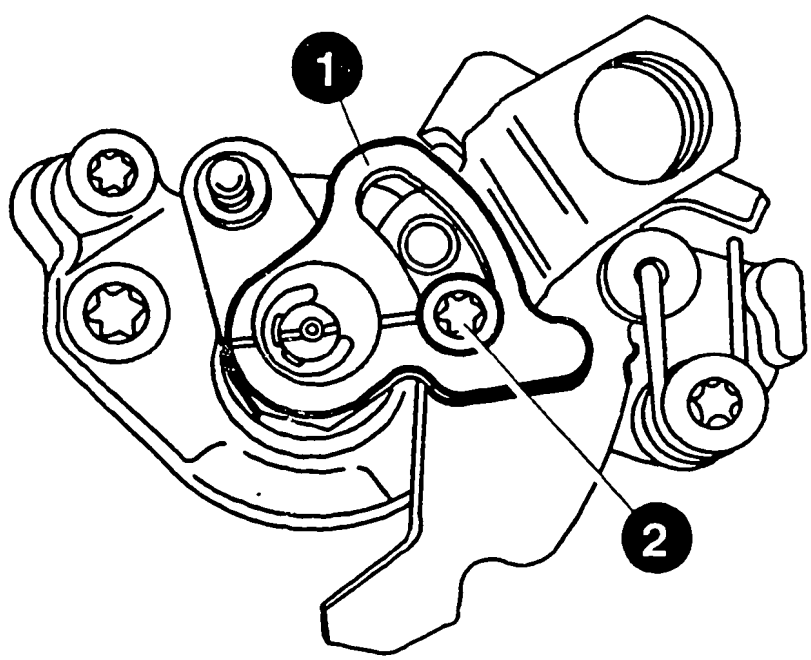
1 = Basic lever
2 = Fastening screw

Determine KSB stroke:
Fix KSB control lever in 2nd detent position.
Turn basic lever until pressure point (start of stroke) is reached.
Fix basic lever in this position.

Tighten fastening screw.

Continue: H17/1 Fig.: H08/2

KMK03401

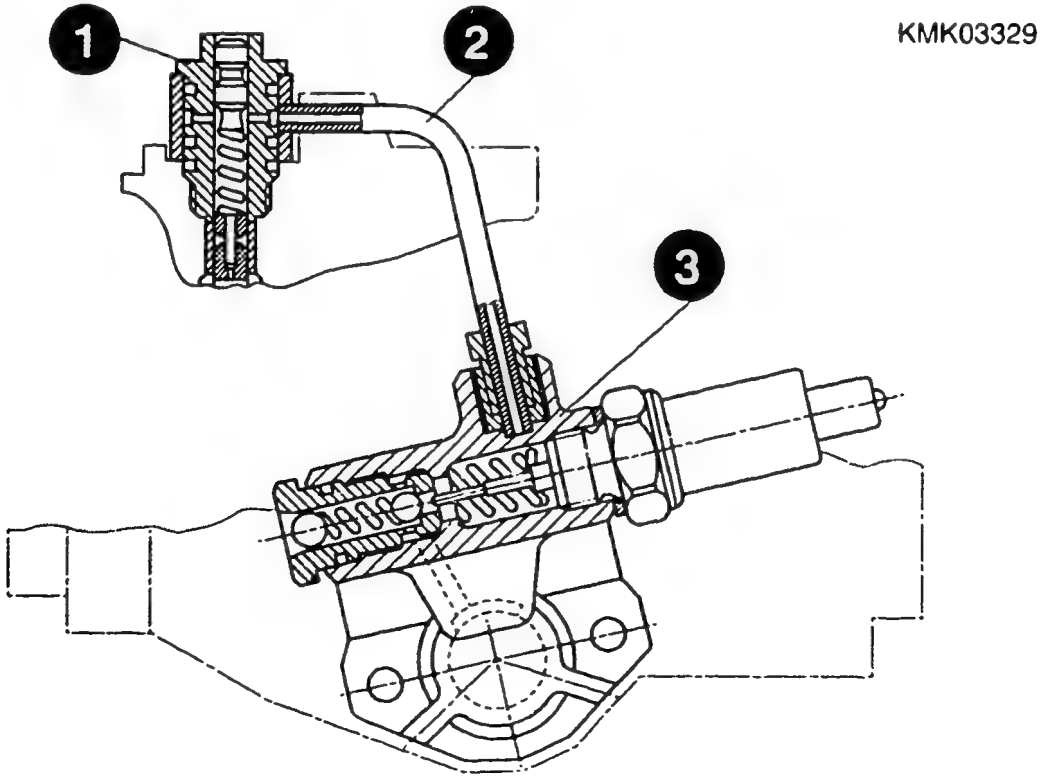


## ATTACHING HYDRAULIC COLD START ACCELERATION DEVICE

1 = Pressure regulator
2 = Ring main
3 = KSB control valve

Install KSB control valve on spring side of timing device.

Continue: H10/1 Fig.: H09/2



INSTALLING PRESSURE REGULATOR

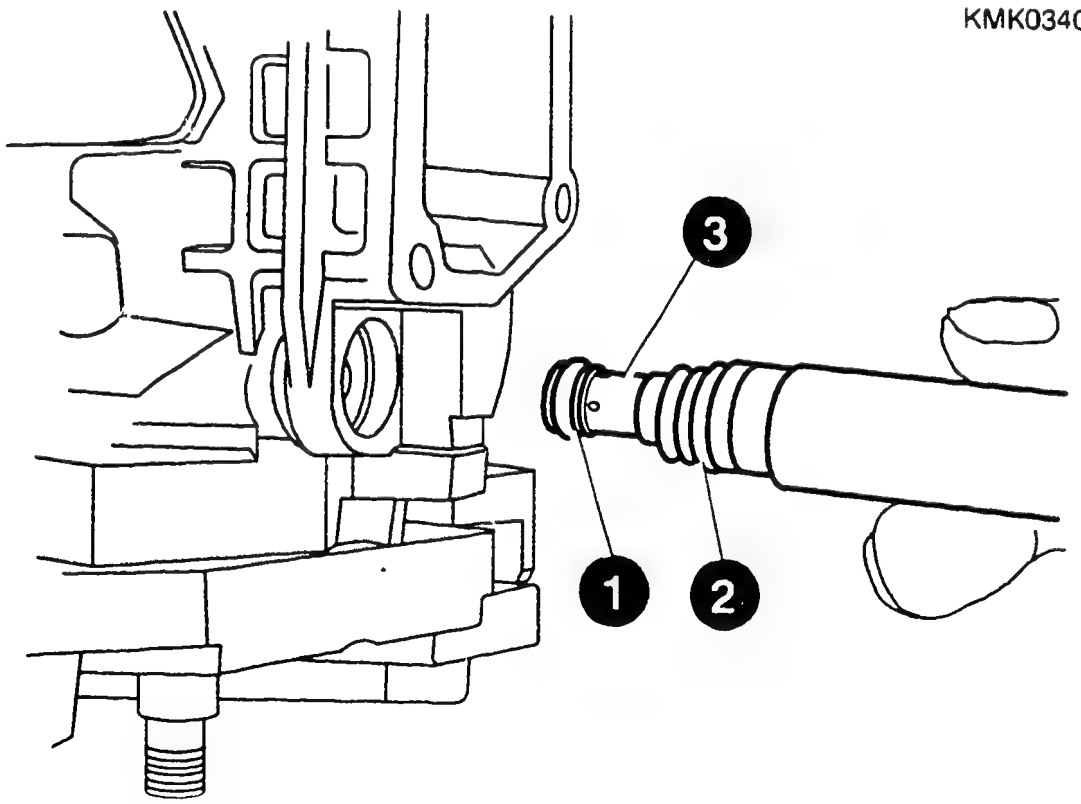
1 = O-ring
2 = O-ring
3 = Pressure regulator

Attach O-ring to pressure regulator. Use socket wrench KDEP 1086 to screw pressure regulator into pump housing.

Install ring main for KSB control valve.

Continue: H18/1 Fig.: H10/2

KMK03402



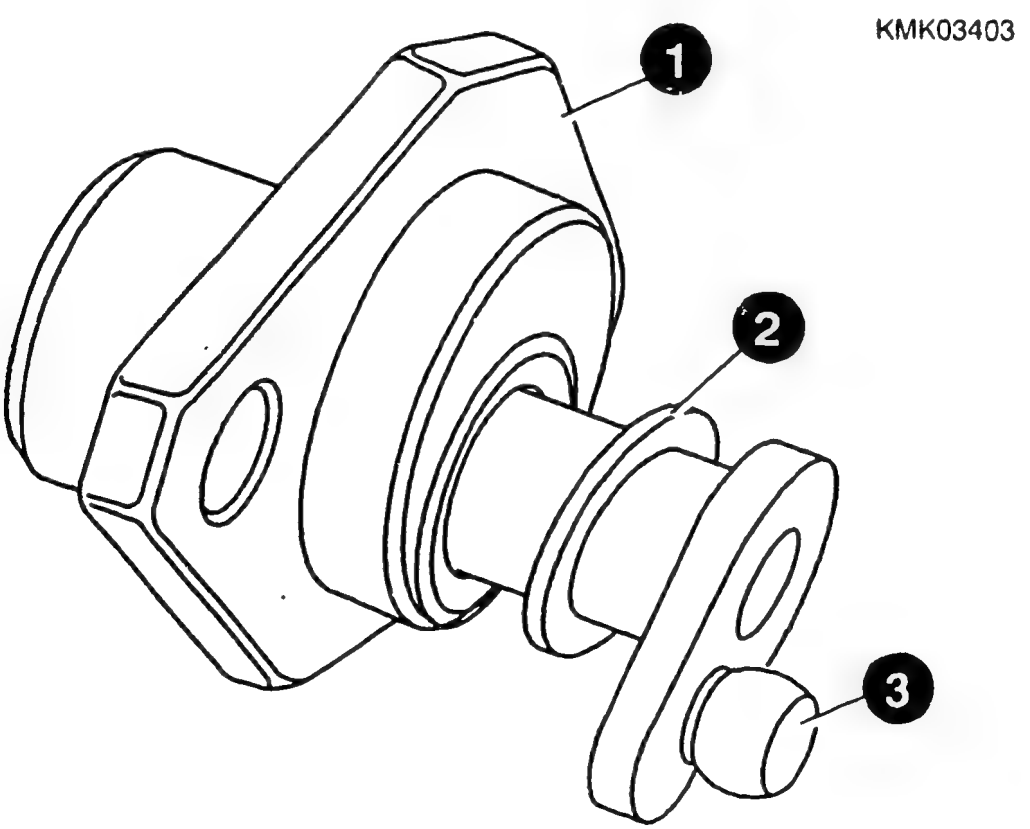
ATTACHING TEMPERATURE-CONTROLLED
COLD START ACCELERATION DEVICE (KSB)

1 = Fitting cover
2 = Shim
3 = Setting shaft

Insert setting shaft with shim into fitting cover.

Insert O-ring in recess in fitting cover on control lever end and press completely into seat.

Continue: H12/1 Fig.: H11/2



## ATTACHING TEMPERATURE–CONTROLLED COLD START ACCELERATION DEVICE (KSB)

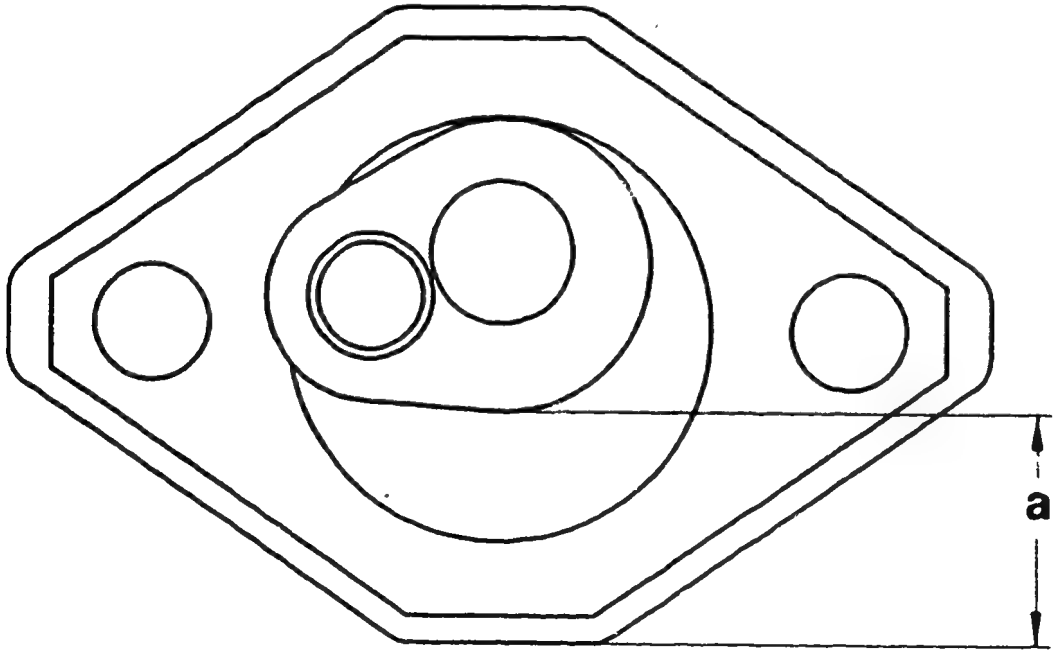
Swivel fitting cover such that inside of cover with spherical bolt of adjustment shaft faces upwards.

The guide hole in the adjustment shaft is arranged eccentrically in the fitting cover.

When fitting cover is viewed from top, the larger spacing between cover and hole edge must point towards body (a).

Continue: H13/1 Fig.: H12/2

KMK03404

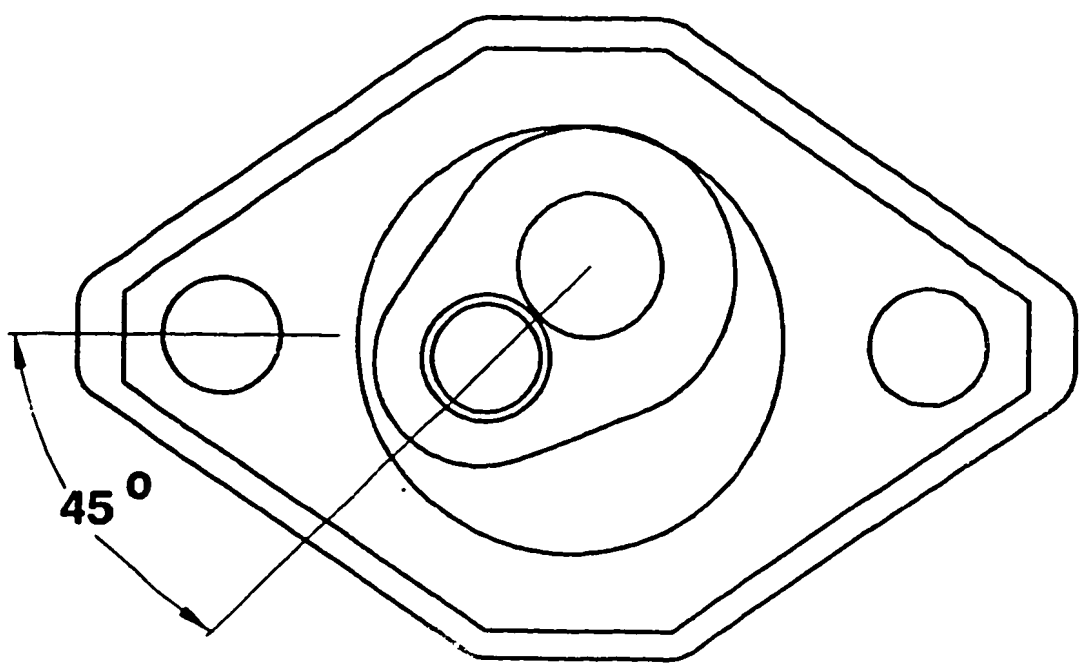


## ATTACHING TEMPERATURE-CONTROLLED COLD START ACCELERATION DEVICE (KSB)

Swivel adjustment shaft to approx. 45° with respect to cross-axis of fitting cover.

Continue: H14/1 Fig.: H13/2

KMK03405



ATTACHING TEMPERATURE-CONTROLLED
COLD START ACCELERATION DEVICE (KSB)

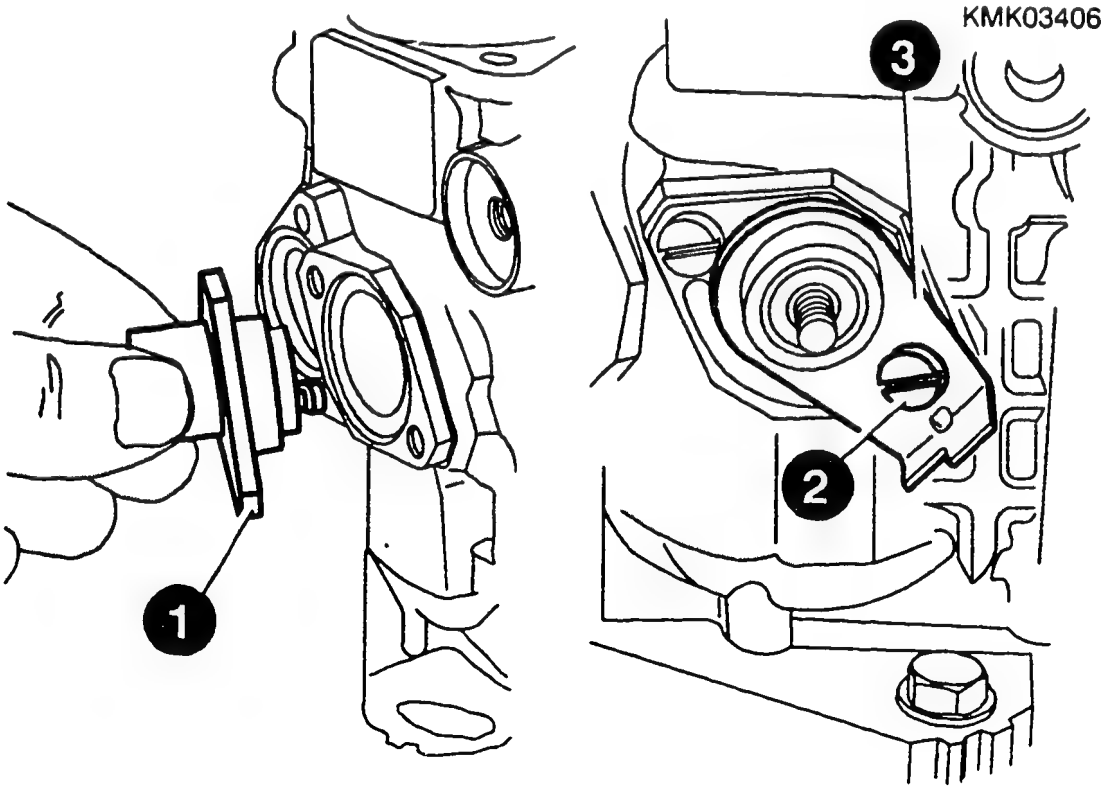
1 = Fitting cover
2 = Fastening screws
3 = Stop bracket

Insert O-ring into pump housing.

Insert adjustment shaft.
Ensure that spherical bolt faces pump drive end (arrow).

Screw fitting cover and stop bracket to pump housing with fastening screws (picture, right).

Continue: H15/1 Fig.: H14/2



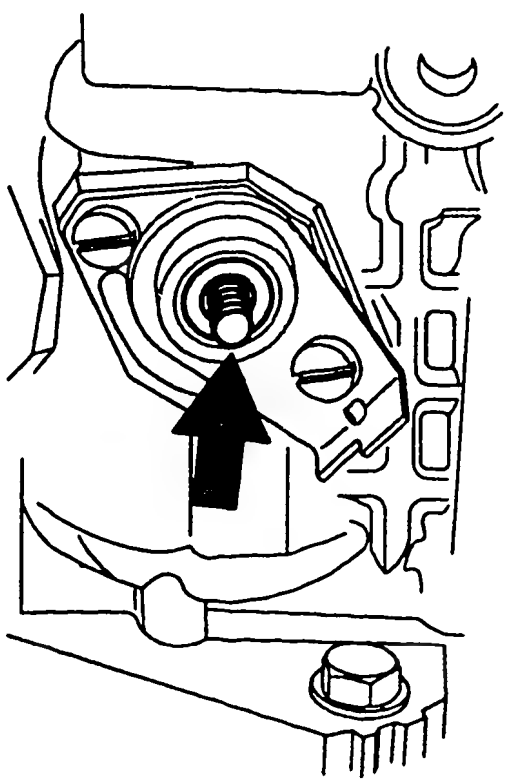
ATTACHING TEMPERATURE-CONTROLLED COLD START ACCELERATION DEVICE (KSB)

Arrow = Setting shaft

Turn setting shaft by hand in direction of arrow until it makes noticeable contact with cam roller ring.

Continue: H16/1 Fig.: H15/2

KMK03407



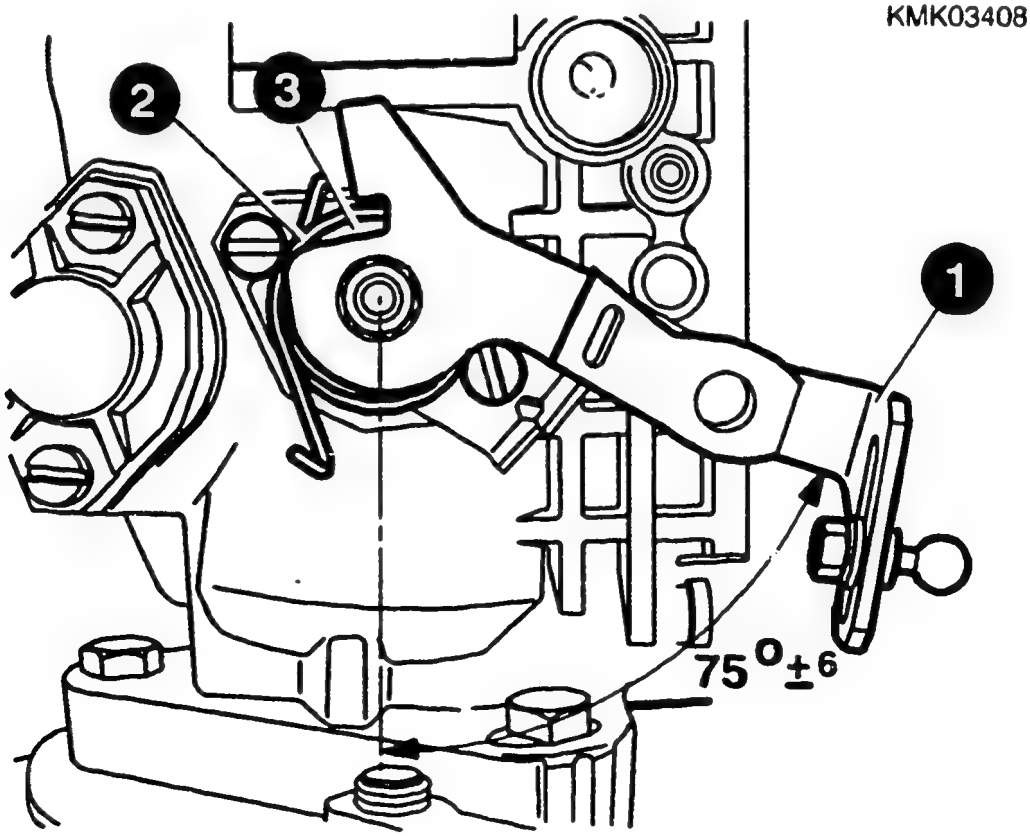
ATTACHING TEMPERATURE-CONTROLLED
COLD START ACCELERATION DEVICE (KSB)

1 = Control lever
2 = Cylindrical helical coiled spring
3 = Shim

Fit cylindrical helical coiled spring and shim.

Attach control lever at angle of 75 +/- 6° to pump longitudinal axis to setting shaft and secure with hexagon nut.

Continue: H17/1 Fig.: H16/2



## INSTALLING PRESSURE REGULATOR

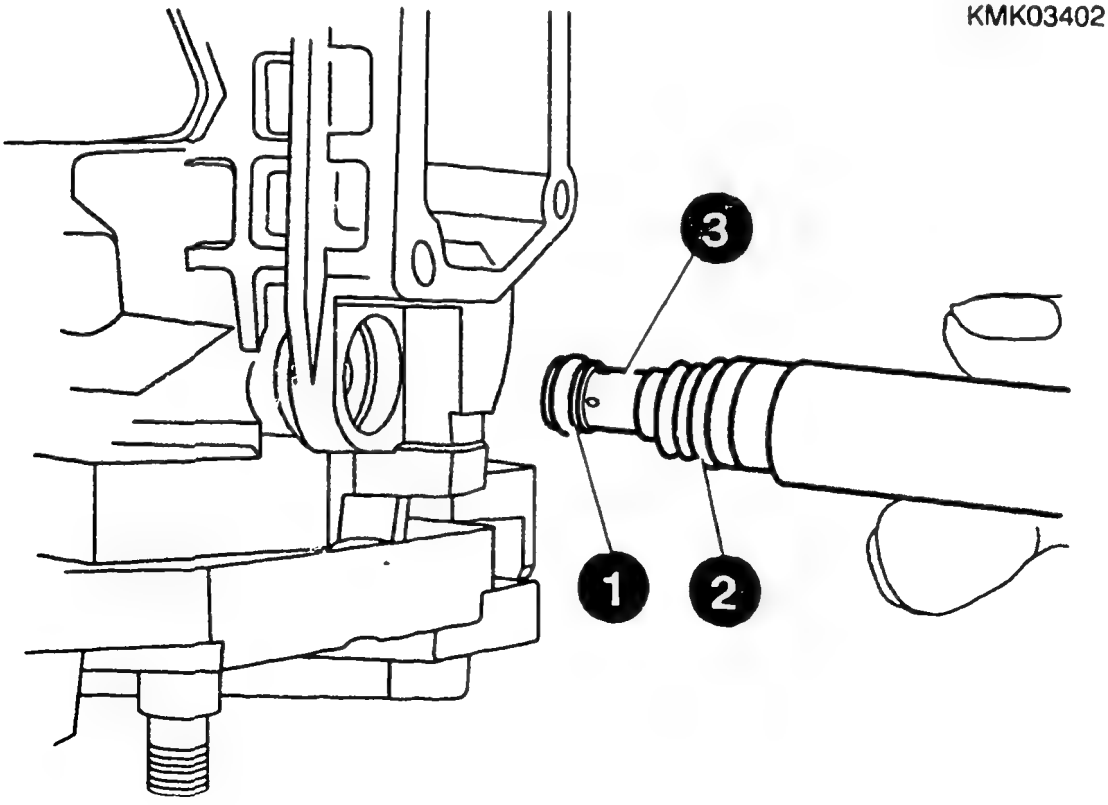
1 = O-ring
2 = O-ring
3 = Pressure regulator

Attach O-rings to pressure regulator.

Use socket wrench KDEP 1086 to screw pressure regulator into pump housing.

Continue: H18/1 Fig.: H17/2

KMK03402



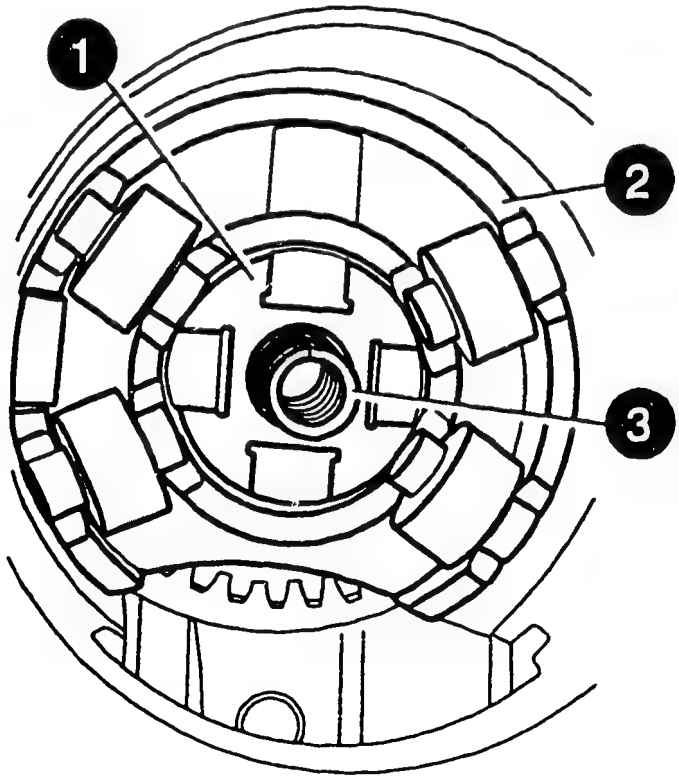
## INSTALLING SLOTTED WASHER

1 = Slotted washer
2 = Cam roller ring
3 = Compression spring

Insert slotted washer in cam roller ring. In doing so, pay attention to following installation position:
If there is a compression spring between slotted washer and cam plate, the larger hole envisaged for this purpose must face towards distributor-head side.

Continue: H19/1 Fig.: H18/2

KMK0340S



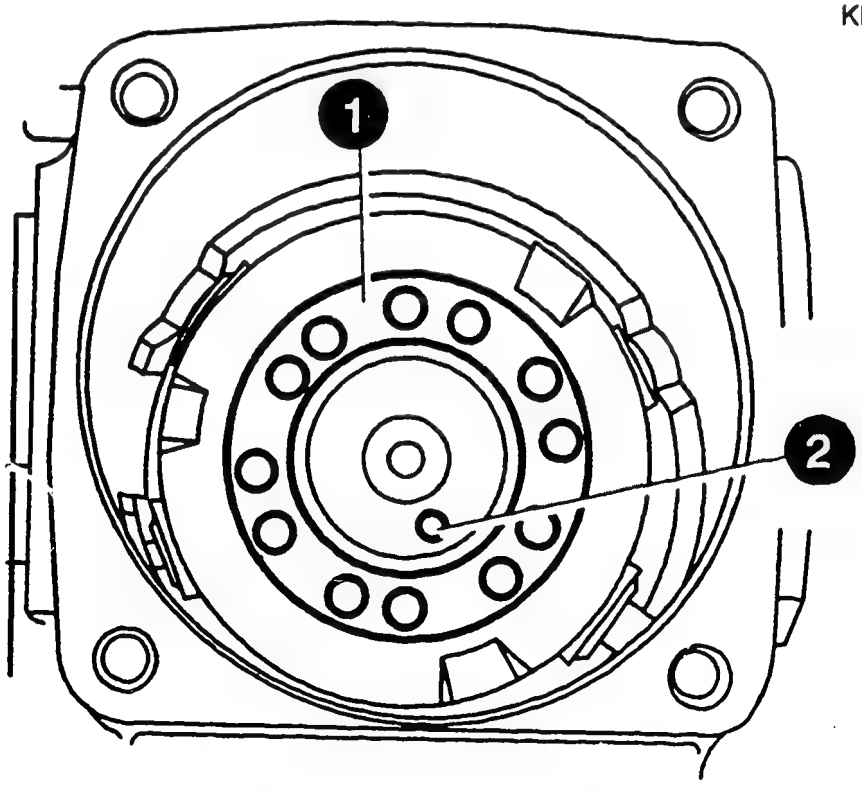
## INSTALLING CAM PLATE

1 = Cam plate
2 = Driver pin

Insert cam plate such that driver pin faces in direction of Woodruff-key groove of drive shaft.

Continue: H20/1 Fig.: H19/2

KMK03410



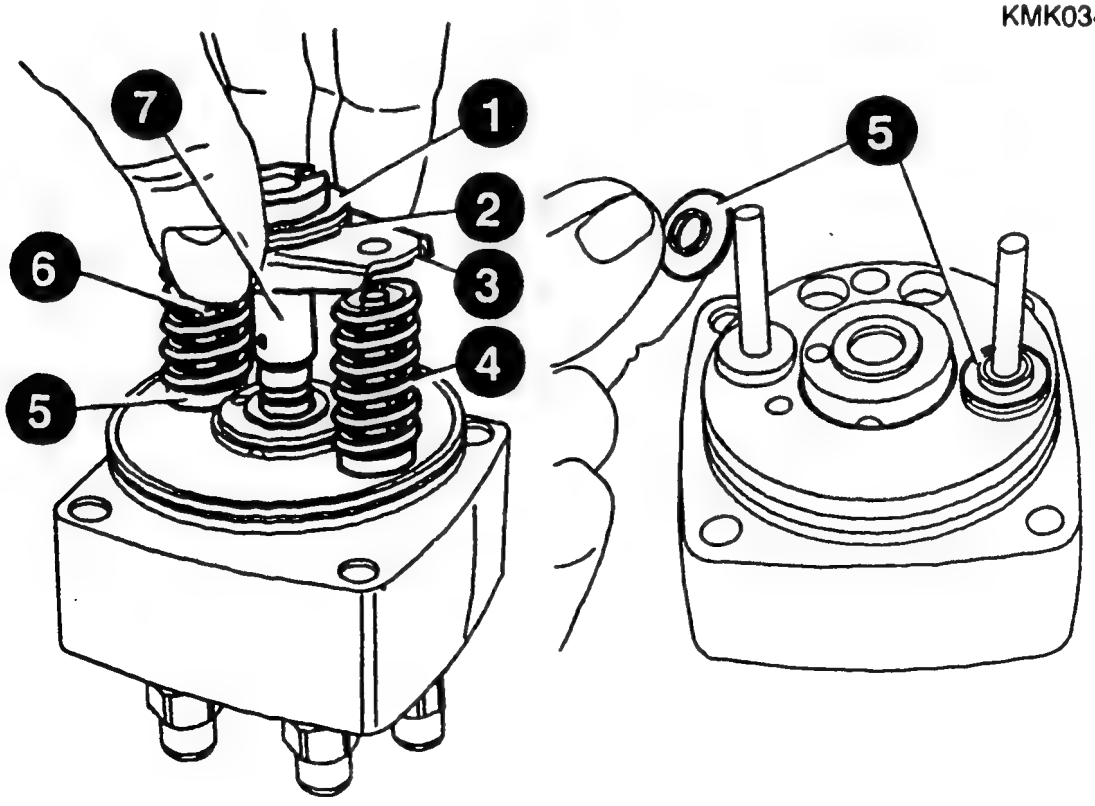
## DETERMINING PLUNGER RETURN SPRING DIMENSION "KF"

1 = Shim
2 = Slotted washer
3 = Top spring seat
4 = Compression springs
5 = Bottom spring seat
6 = Guide pins
7 = Distributor-pump plunger

Insert guide pins into distributor head; slip both bottom spring seats without spacers onto guide pins.
NOTE: Spacers are positioned beneath spring seats (picture, right).

Continue: H21/1 Fig.: H20/2

KMK03411



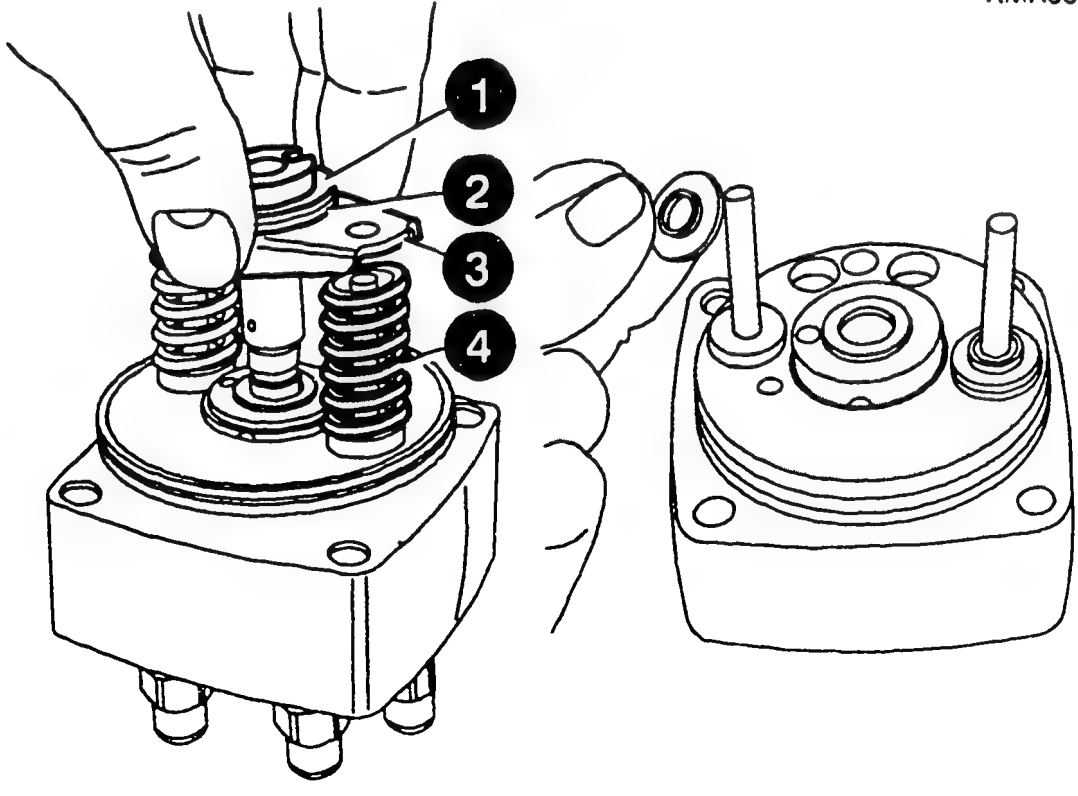
## DETERMINING PLUNGER RETURN SPRING DIMENSION "KF"

1 = Shim
2 = Slotted washer
3 = Spring seat
4 = Compression springs

Fit compression springs.
Attach shim, slotted washer and spring seat to distributor-pump plunger.
Insert distributor-pump plunger, complete into distributor head exerting maximum caution.

Continue: H22/1 Fig.: H21/2

KMK03412



## DETERMINING PLUNGER RETURN SPRING DIMENSION "KF"

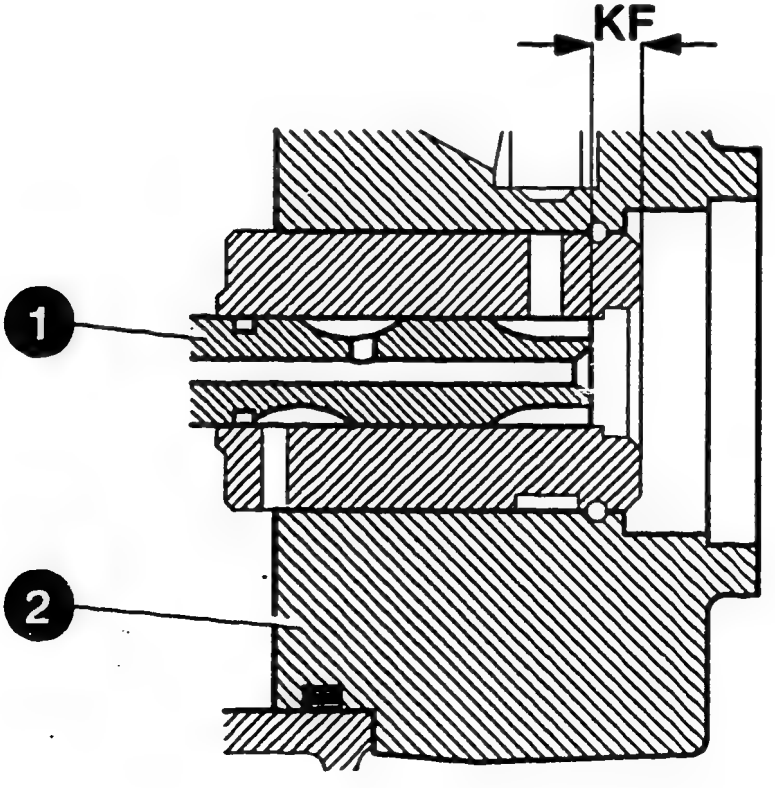
1 = Distributor-pump plunger
2 = Distributor head

The dimension "KF" is the distance between the end-face sealing surface of the distributor head and the end face of the distributor-pump plunger (see picture).

Calibration is effected with dial indicator and holder (KDEP 1088).

Continue: H23/1 Fig.: H22/2

KMK03413

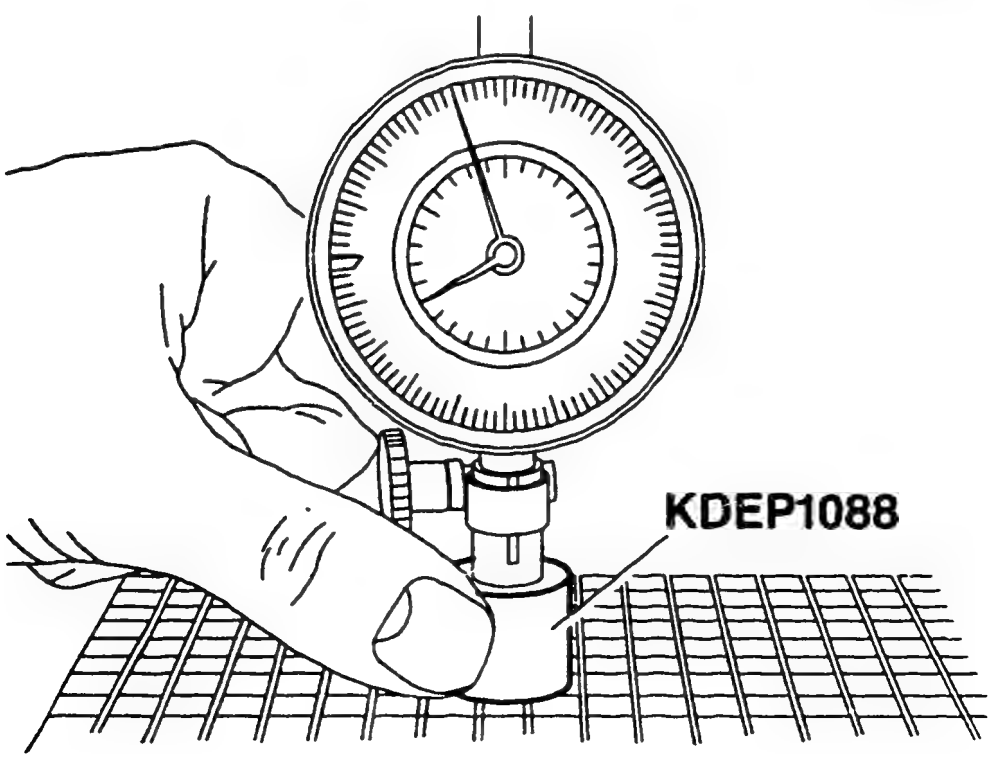


## DETERMINING PLUNGER RETURN SPRING DIMENSION "KF"

Clamp dial indicator 1 687 233 012 with measurement insert in position in holder KDEP 1088.
Position holder on marking plate such that it is flat, initially tension dial indicator approx. 20 mm and set to "0".

Continue: H24/1 Fig.: H23/2

KMK03414

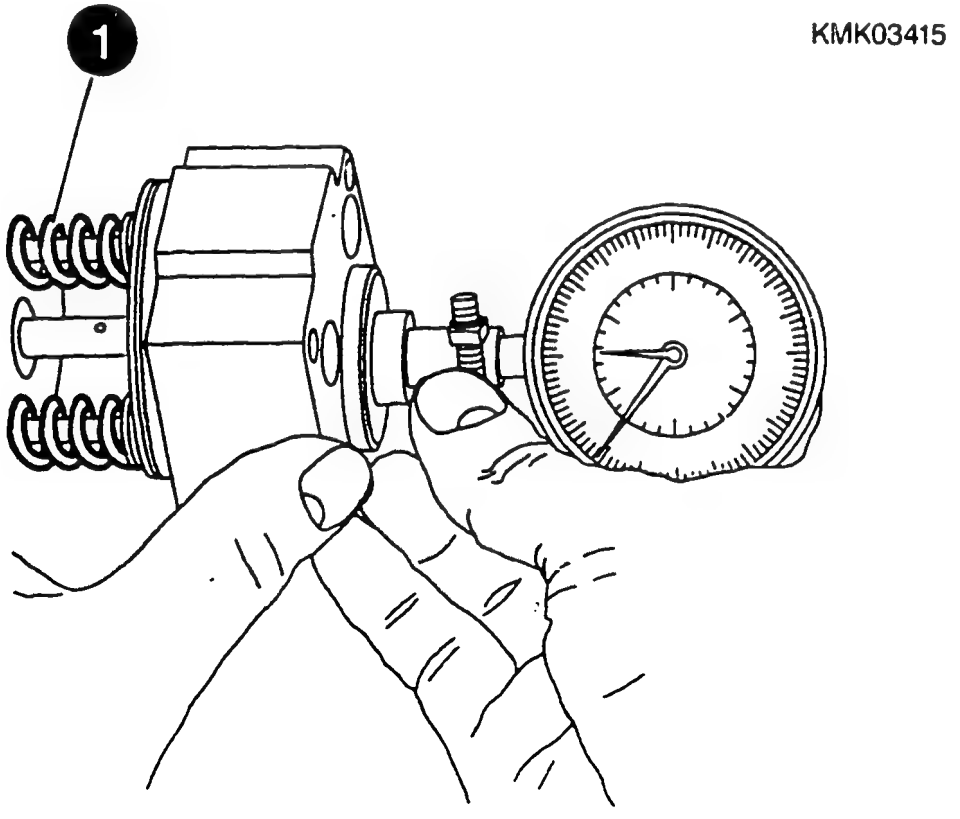


## DETERMINING PLUNGER RETURN SPRING DIMENSION "KF"

1 = Compression spring
2 = Spring seat

Hold distributor head such that it is horizontal (see picture).
Place dial-indicator holder KDEP 1088 such that it is flat on sealing surface in distributor head.
Exert axial pressure on bottom of distributor-pump plunger and make friction-locked connection only for compression springs.
(DO NOT OVERCOMPRESS SPRINGS!)

Continue: H25/1 Fig.: H24/2

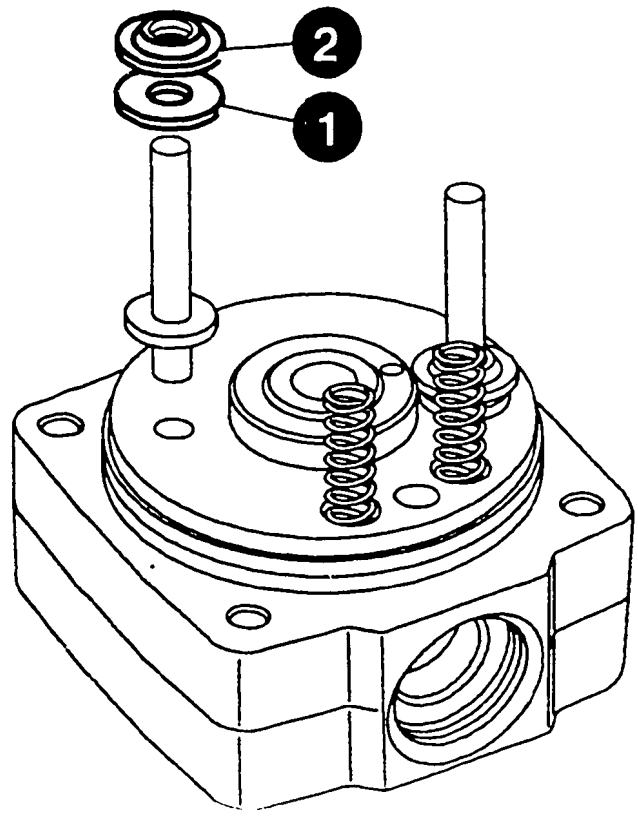


DETERMINING PLUNGER RETURN SPRING DIMENSION "KF"

1 = Spacers
2 = Spring seat

Compare measured dimension (red dial-indicator numbers) to desired dimension "KF" given in test-specification sheet.
Provide compensation if necessary with appropriate spacers (beneath spring seat). If the selection is between 2 existing shim thicknesses, the thicker spacer is to be chosen.
Note:
There may only be one shim of same thickness on either side.

Continue: H26/1 Fig.: H25/2




KMK03416

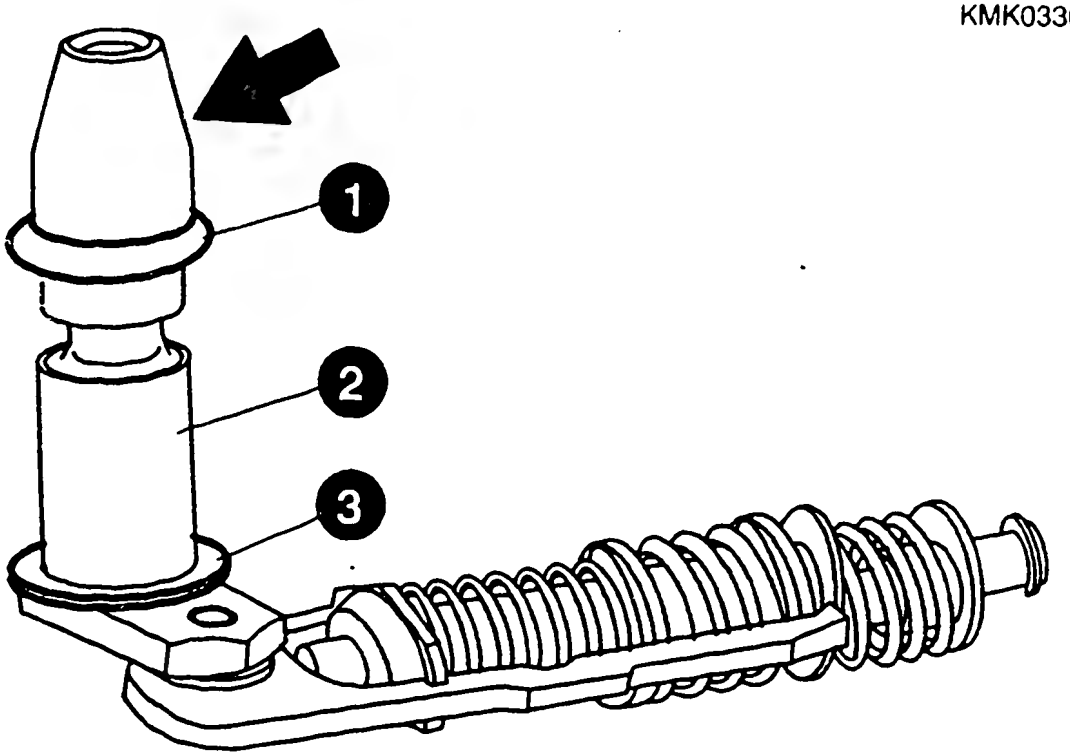
ASSEMBLING HOUSING COVER

1 = O-ring
2 = Setting shaft
3 = Shim

Slip shim onto setting shaft; fit O-ring with assembly sleeve KDEP 2937 (arrow).
Pull setting shaft with assembly wrench KDEP 1096 through housing cover.

Continue: H27/1 Fig.: H26/2

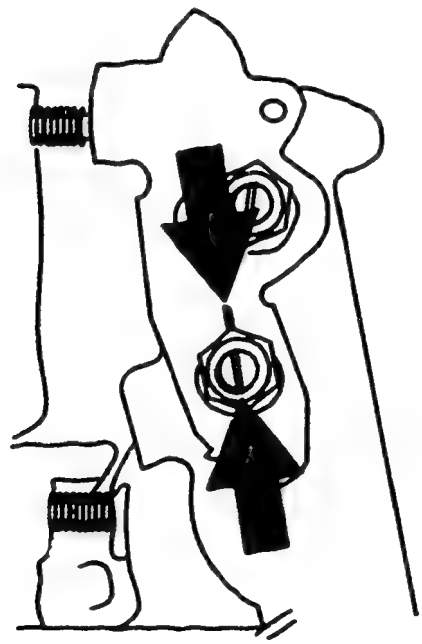
KMK03309



## ASSEMBLING HOUSING COVER

Place cylindrical helical coiled spring on housing cover.
- Part-load-governor version
Position control lever on setting shaft such that marks on control lever and setting shaft coincide (arrows - picture).
- Variable-speed-governor version
Fit control lever in parallel with lever of setting shaft.
Fit hexagon nut with spring lock washer (not illustrated).

Continue: H28/1 Fig.: H27/2



KMK02289

## ADJUSTING STOP REGULATION LEVER

Select adjustment in line with following characteristic features:

* Pump with stop lever and TAS (temperature-dependent excess fuel quantity) J01/1

* Pump with no stop lever J26/1

Continue: J01/1

## ADJUSTING STOP REGULATION LEVER

If the attachment position of the stop lever/TAS with respect to the lever shaft has not been marked, assignment must be calibrated.

Adjustment of the various shutoff devices is governed by the shape of the stop lever/the shape of the regulating lever.

Continue: J01/2

## ADJUSTING STOP REGULATION LEVER

Select stop-lever versions as per illustration:

| | Coordinate |
|---|---|
| * TAS version | J02/1 |
| * Normal version<br>Stop-lever stop on left | J03/1 |
| * Normal version<br>Stop-lever stop on right | J04/1 |
| * Special version A | J05/1 |
| * Special version B | J06/1 |
| * Negative torque control | J07/1 |

Continue: J02/1

ADJUSTING SHUTOFF REGULATING LEVER

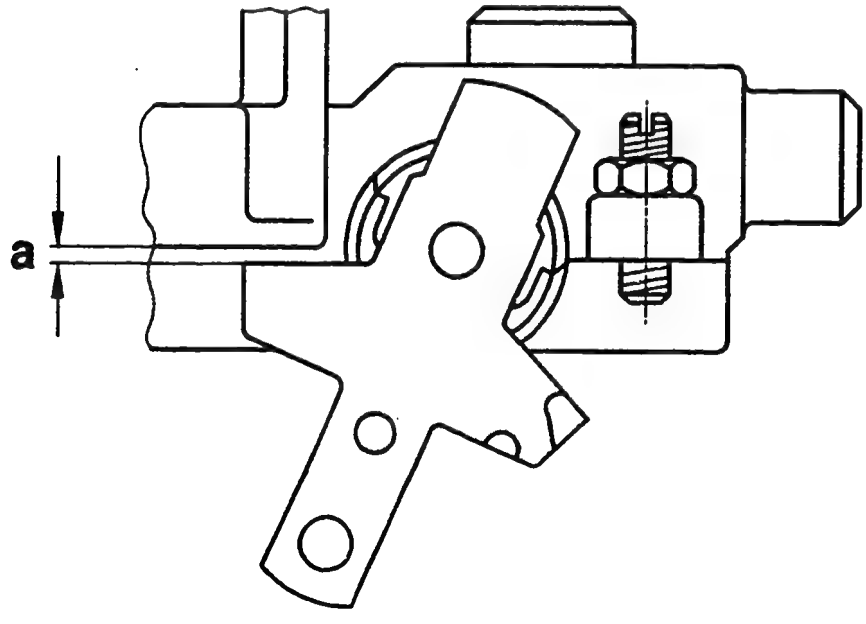
Version: Temperature-dependent excess fuel quantity (TAS)

Continue: J08/1

## ADJUSTING STOP/REGULATING LEVER

Stop lever, left
Standard version

Continue: J10/1 Fig.: J03/2

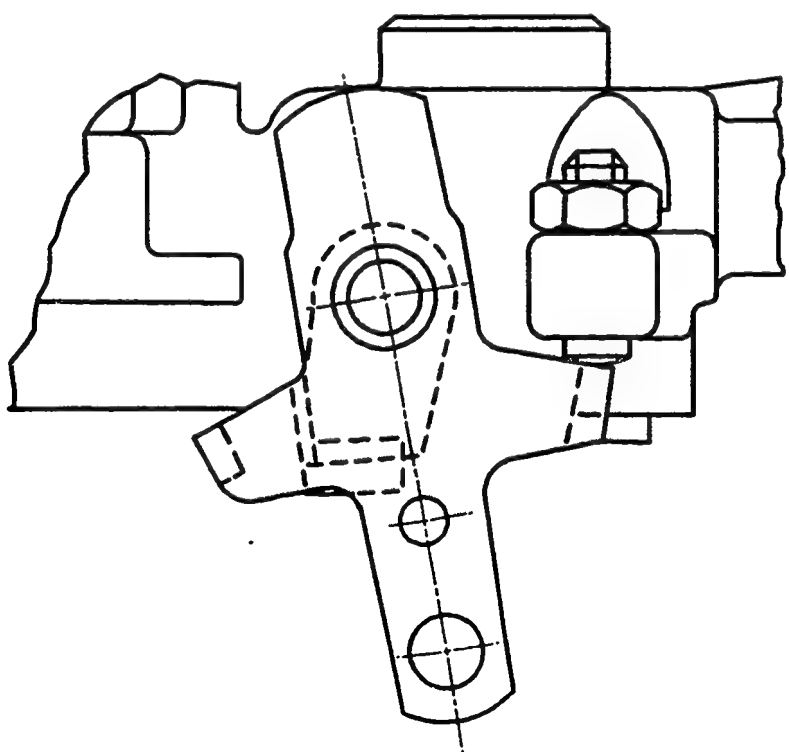



KMK02290

# ADJUSTING STOP/REGULATING LEVER

Stop lever, right
Standard version

Continue: J12/1 Fig.: J04/2

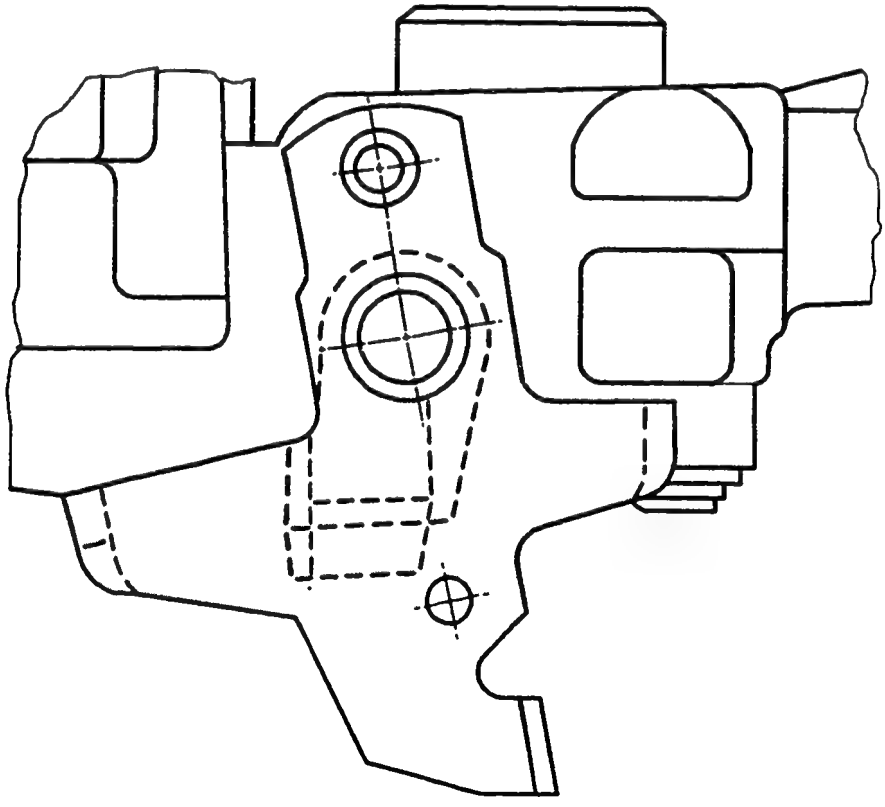


KMK02291

## ADJUSTING STOP/REGULATING LEVER

Stop lever –
Special version A:

Continue: J16/1 Fig.: J05/2

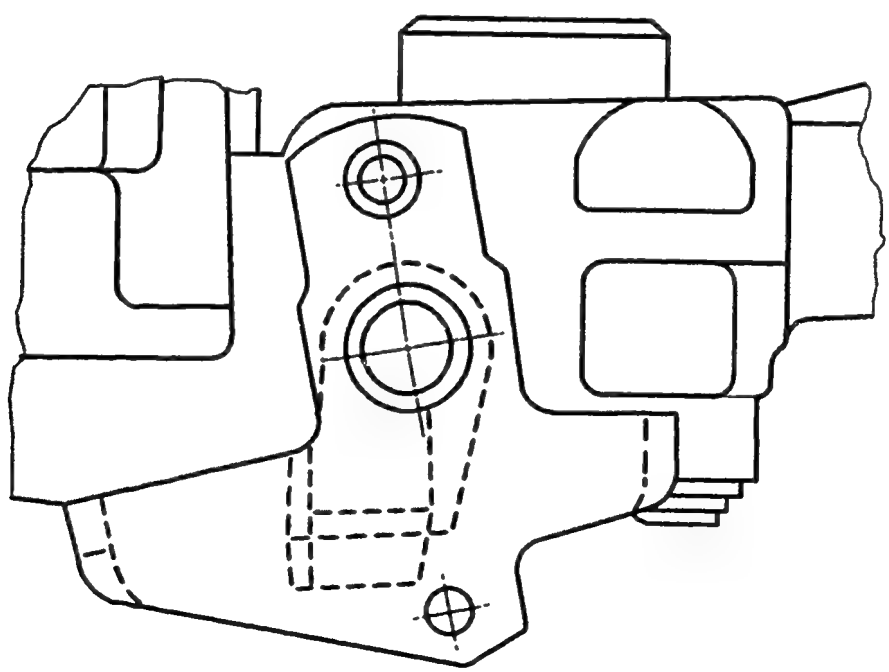


KMK02292

# ADJUSTING STOP/REGULATING LEVER

Stop lever –
Special version B

Continue: J19/1 Fig.: J06/2

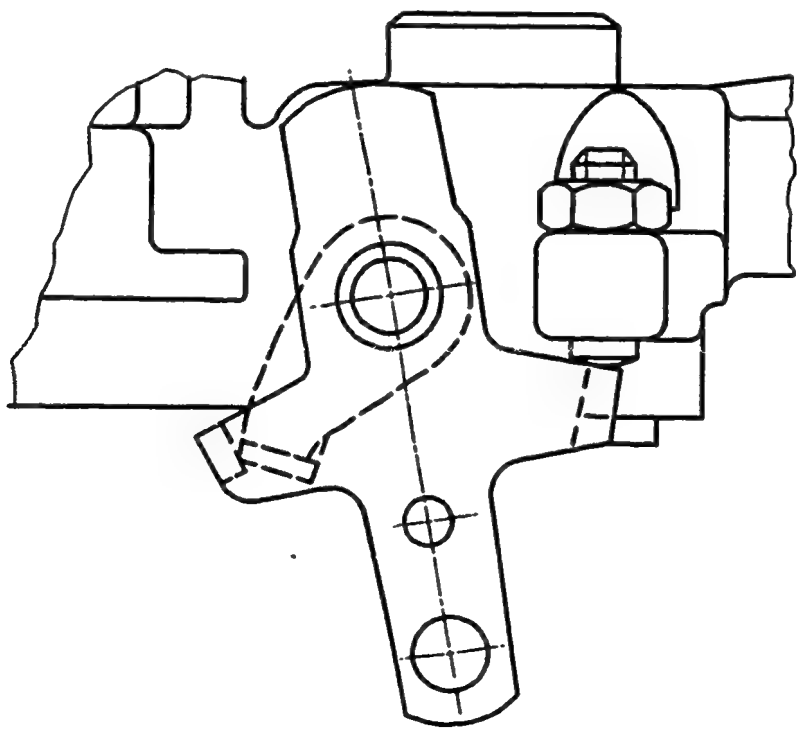


KMK02293

## ADJUSTING STOP/REGULATING LEVER

Stop lever –
Negative torque control

Continue: J22/1 Fig.: J07/2



KMK02294

## ADJUSTING SHUTOFF REGULATING LEVER

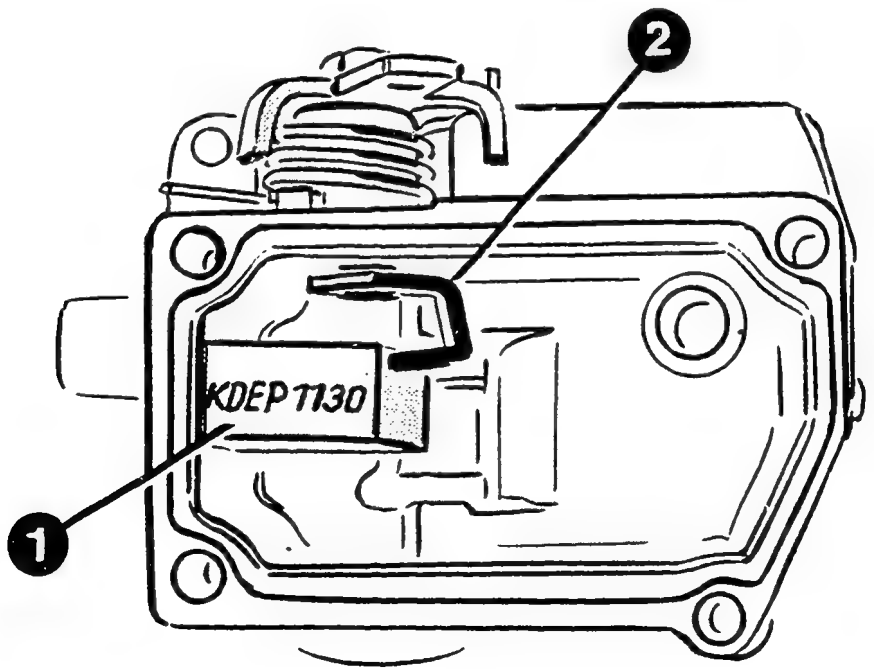
* TAS version

1 = Spacer
2 = Regulating lever

Insert lever shaft into housing cover.

Place spacer KDEP 1130 between inside edge of housing cover and regulating lever.

Continue: J09/1 Fig.: J08/2



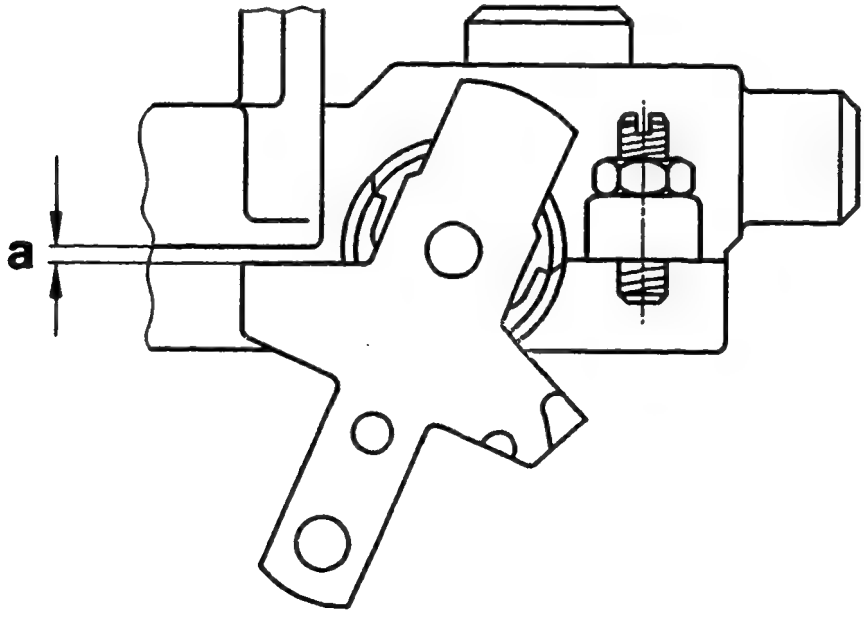

KMK 02295

## ADJUSTING SHUTOFF REGULATING LEVER

* TAS version

In this position, mount regulating lever such that there is an extremely small gap of min. 3.0 mm between regulating lever and housing cover.

Continue: J26/1 Fig.: J09/2




KMK02290

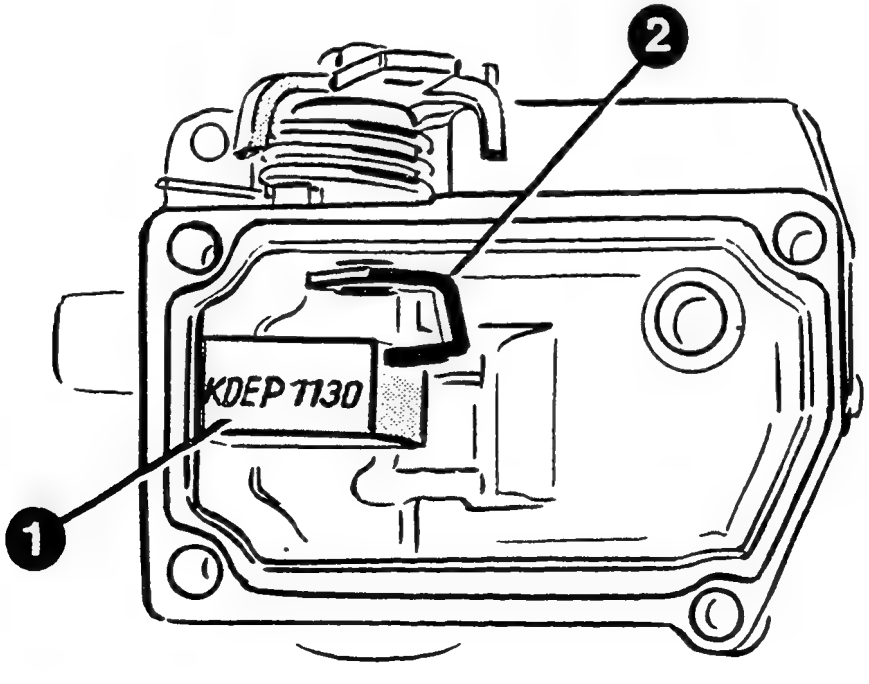
## ADJUSTING STOP/REGULATING LEVER

* Stop lever, left, standard version

1 = Spacer KDEP 1130
2 = Regulating lever

Position spacer KDEP 1130 between inside edge of housing cover and regulating lever.

Continue: J11/1 Fig.: J10/2




KMK 02295

## ADJUSTING STOP/REGULATING LEVER

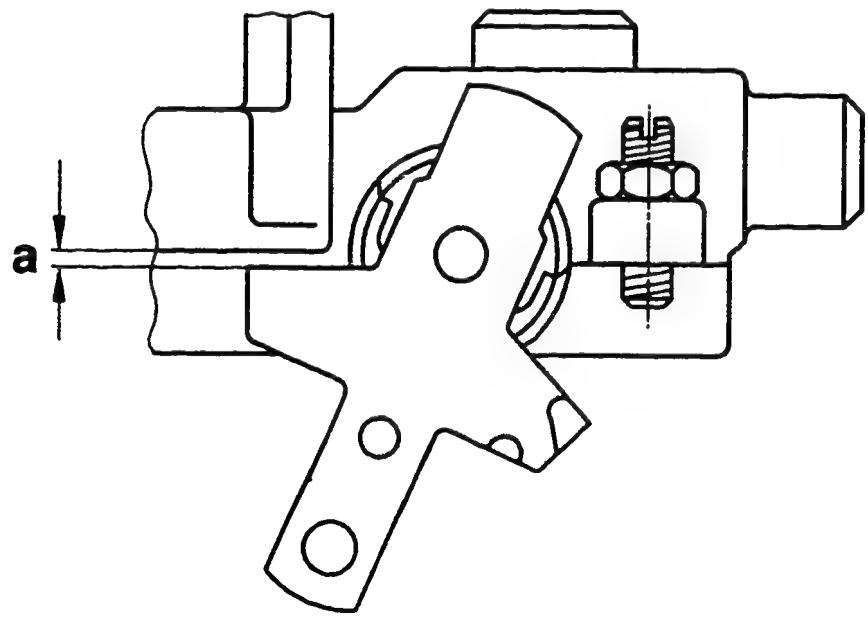
* Stop lever, left, standard version

Position stop lever on setting shaft.

There must be a gap "a" = 2...5 mm between stop lever and housing in this position.

If not, alter stop lever.

Continue: J26/1 Fig.: J11/2




KMK02290

## ADJUSTING STOP/REGULATING LEVER

* Stop lever, right, standard version

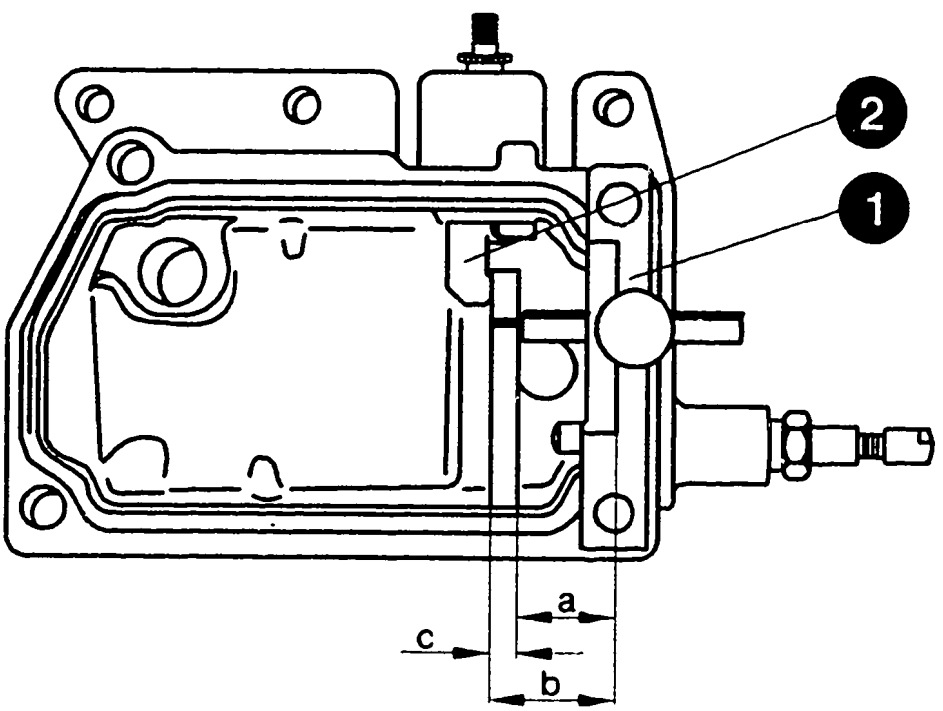
1 = Measurement tool
2 = Regulating lever

Attach KDEP 1152/3 to housing cover; determine and note down dimension "c" (thickness of measurement arm).

Calculate dimension "a" (a=b-c) and adjust measurement arm to this dimension.

Dimension "b"= 19.3 mm

Continue: J13/1 Fig.: J12/2




KMK02296

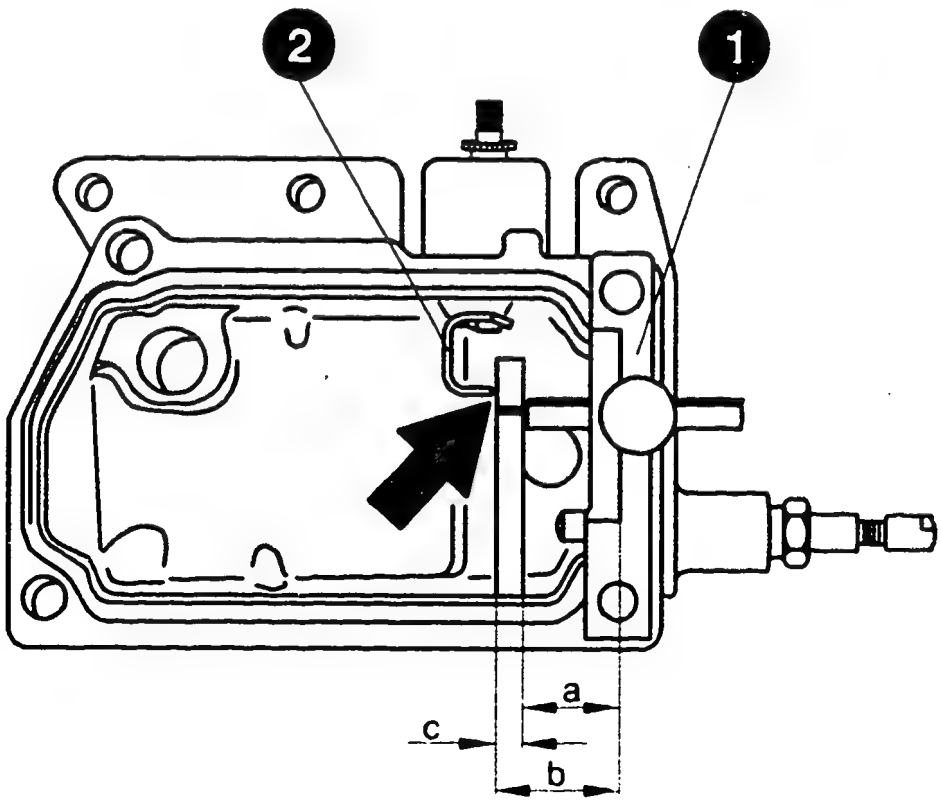
## ADJUSTING STOP/REGULATING LEVER

* Stop lever, right, standard version

1 = Measurement tool
2 = Regulating lever

Clamp measurement tool KDEP 1152/3 in this position and press regulating lever against measurement arm (arrow). Regulating lever must be in contact with measurement arm KDEP 1152/3 for subsequent operations.

Continue: J14/1 Fig.: J13/2




KMK02297

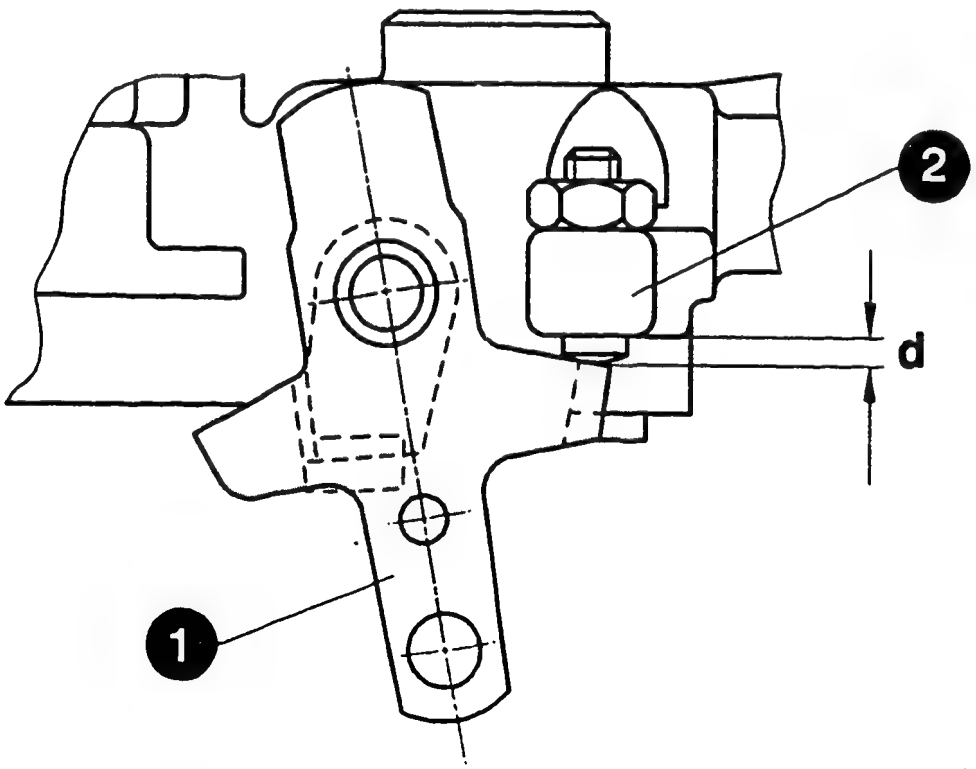
## ADJUSTING STOP/REGULATING LEVER

* Stop lever, right, standard version

1 = Stop lever
2 = Housing stop

Position stop lever on setting-shaft toothing such that dimension "d" between lever and housing stop is as small as possible.
Engage spring.
Press stop lever in direction of housing stop and, at the same time, tighten hexagon nut on setting shaft.
Tightening torque 5...10 Nm.

Continue: J15/1 Fig.: J14/2




KM:K02298

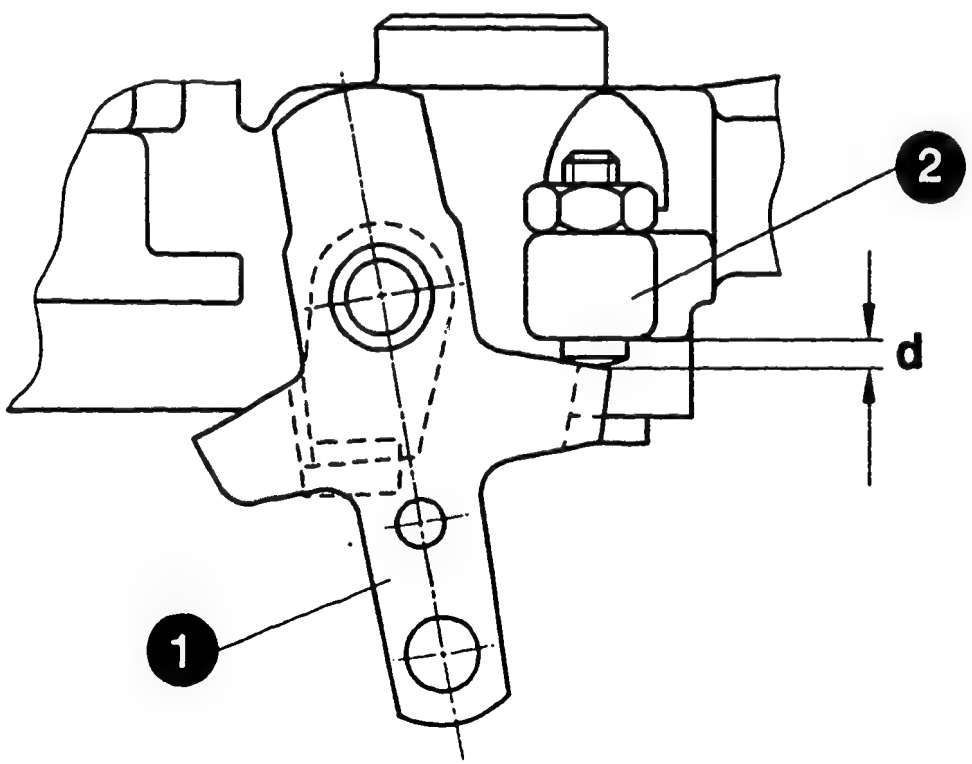
## ADJUSTING STOP/REGULATING LEVER

* Stop lever, right, standard version

1 = Stop lever
2 = Stop screw

Close stop screw on stop lever (dimension "d") and tighten lock nut to tightening torque of 6...9 Nm.

Continue: J26/1 Fig.: J15/2




KMK02298

## ADJUSTING STOP/REGULATING LEVER

* Special version A

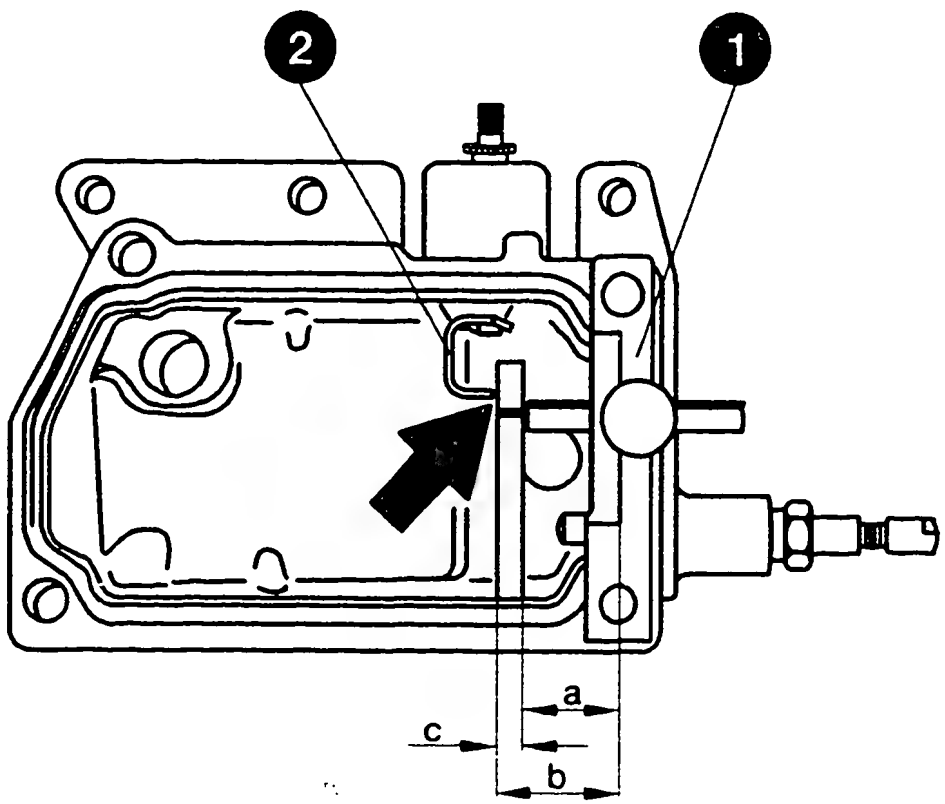
1 = Measurement tool
2 = Regulating lever

Position KDEP 1152/3 on housing cover; determine and note down dimension "c" (thickness of measurement arm).

Calculate dimension "a" (a = b - c) and set measurement arm to this dimension.

Dimension "b"= 20.3 mm

Continue: J17/1 Fig.: J16/2




KMK02297

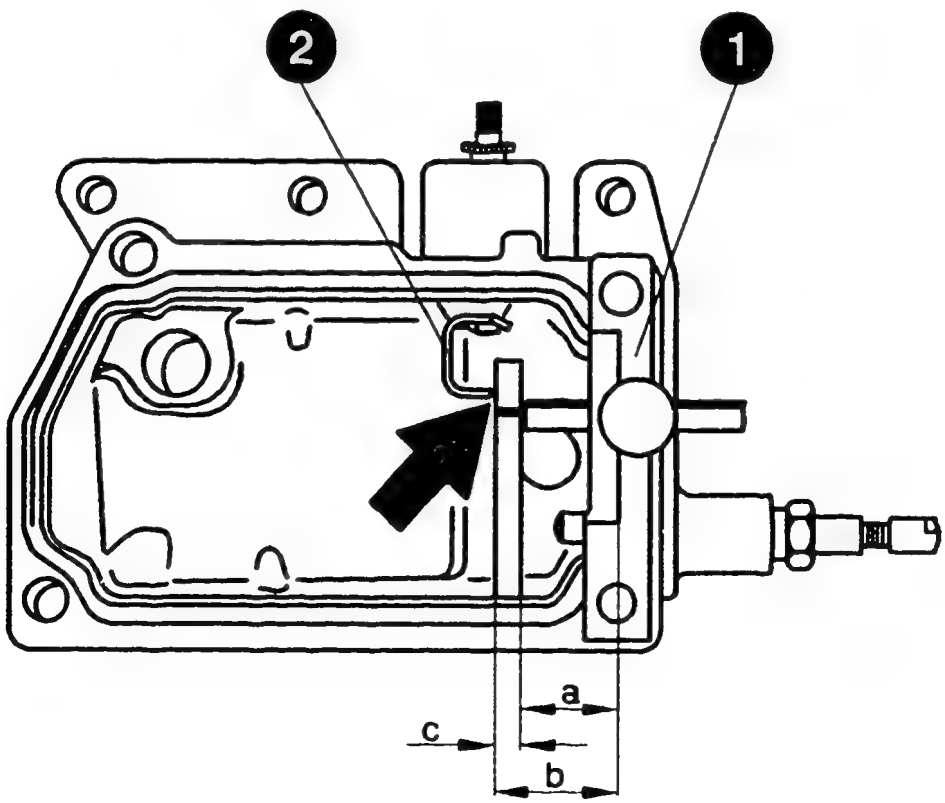
## ADJUSTING STOP/REGULATING LEVER

* Special version A

1 = Measurement tool
2 = Regulating lever

Clamp measurement tool KDEP 1152/3 in this position and press regulating lever against measurement arm (arrow).

Continue: J18/1 Fig.: J17/2




KMK02297

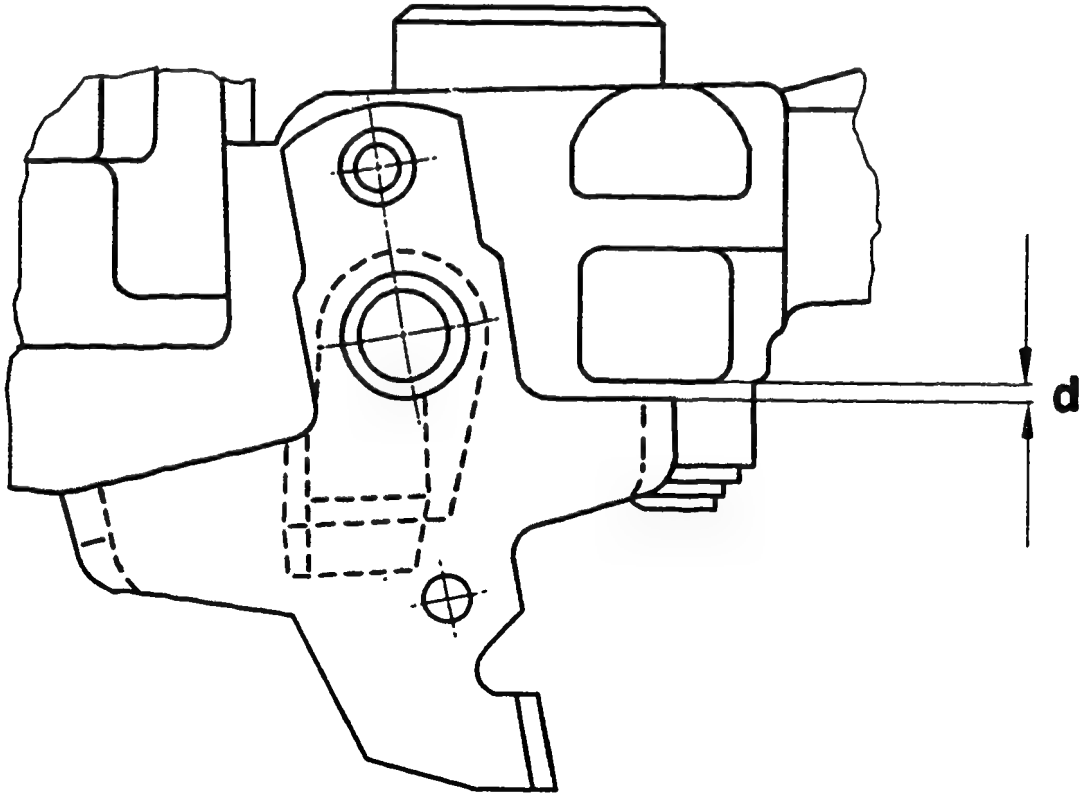
## ADJUSTING STOP/REGULATING LEVER

* Special version A

Position stop lever on setting shaft such that dimension "d" between lever and housing stop is max. 2.0 mm.

Should dimension not be attained, slightly reduce dimension "b" = 20.3 mm.
Engage spring.
Press lever in direction of housing stop and simultaneously tighten hexagon nut on setting shaft to tightening torque of 5...10 Nm.

Continue: J26/1 Fig.: J18/2




KMK02299

ADJUSTING STOP/REGULATING LEVER

* Special version B

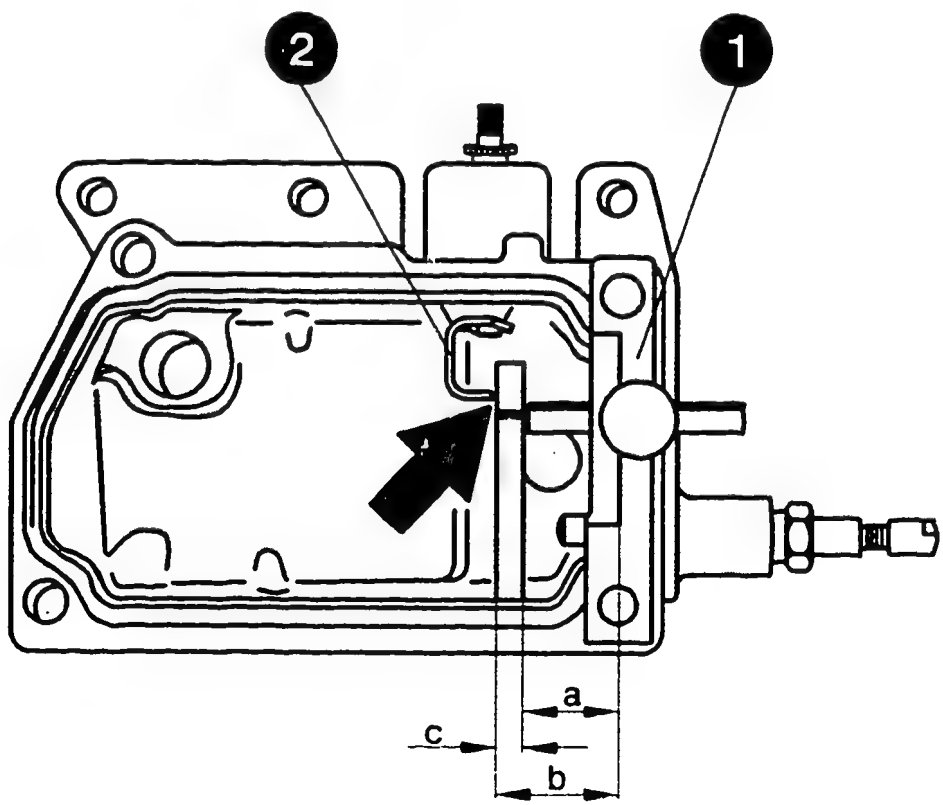
1 = Measurement tool
2 = Regulating lever

Attach KDEP 1152/3 to housing cover; determine and note down dimension "c" (thickness of measurement arm).

Calculate dimension "a" (a = b - c) and set measurement arm to this dimension.

Dimension "b" = 20.3 mm

Continue: J20/1 Fig.: J19/2




KMK02297

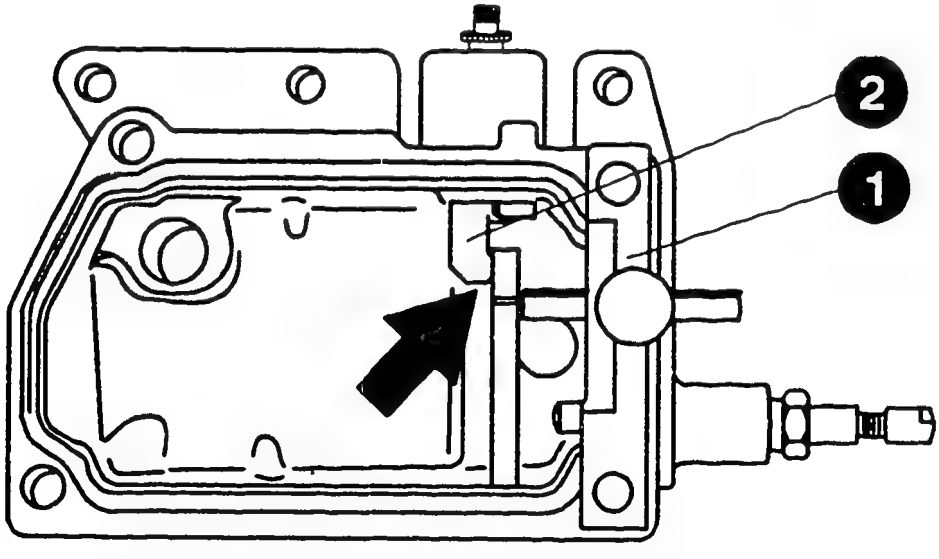
## ADJUSTING STOP/REGULATING LEVER

* Special version B

1 = Measurement tool
2 = Regulating lever

Clamp measurement tool KDEP 1152/3 in this position and press regulating lever against measurement arm (arrow).

Continue: J21/1 Fig.: J20/2




KMK02300

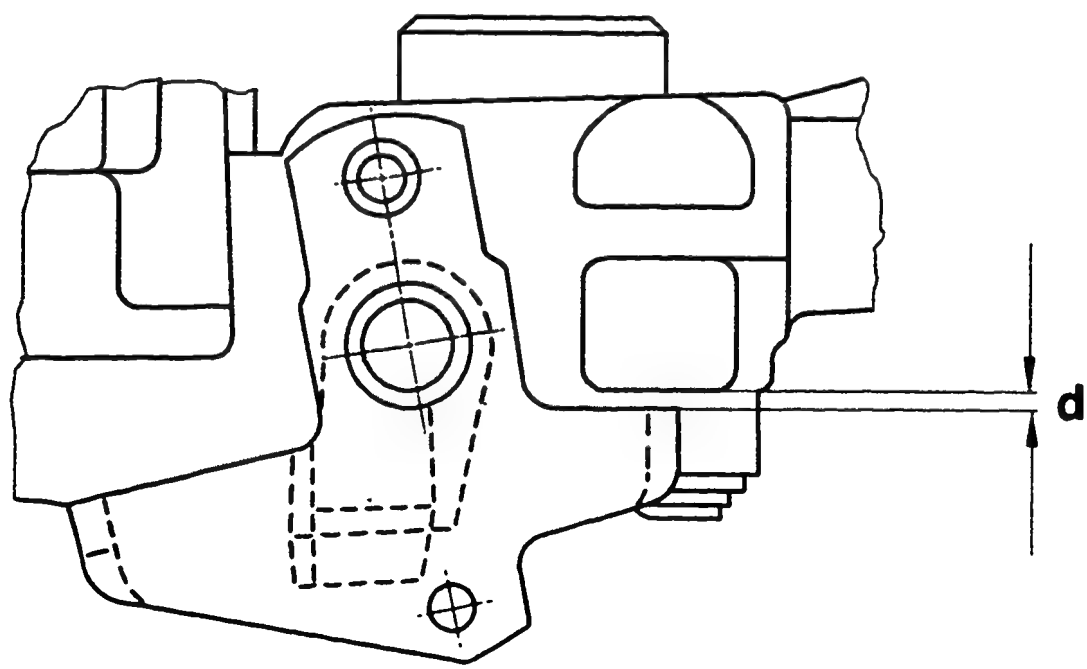
## ADJUSTING STOP/REGULATING LEVER

* Special version B

Position stop lever on setting shaft such tht dimension "d" between lever and housing stop is max. 2.0 mm.

If dimension is not attained, slightly reduce dimension "b" = 20.3 mm.
Engage spring.
Press lever in direction of housing stop and simultaneously tighten hexagon nut on setting shaft to tightening torque of 5...10 Nm.

Continue: J26/1 Fig.: J21/2




KMK02301

## ADJUSTING STOP/REGULATING LEVER

* With negative torque control

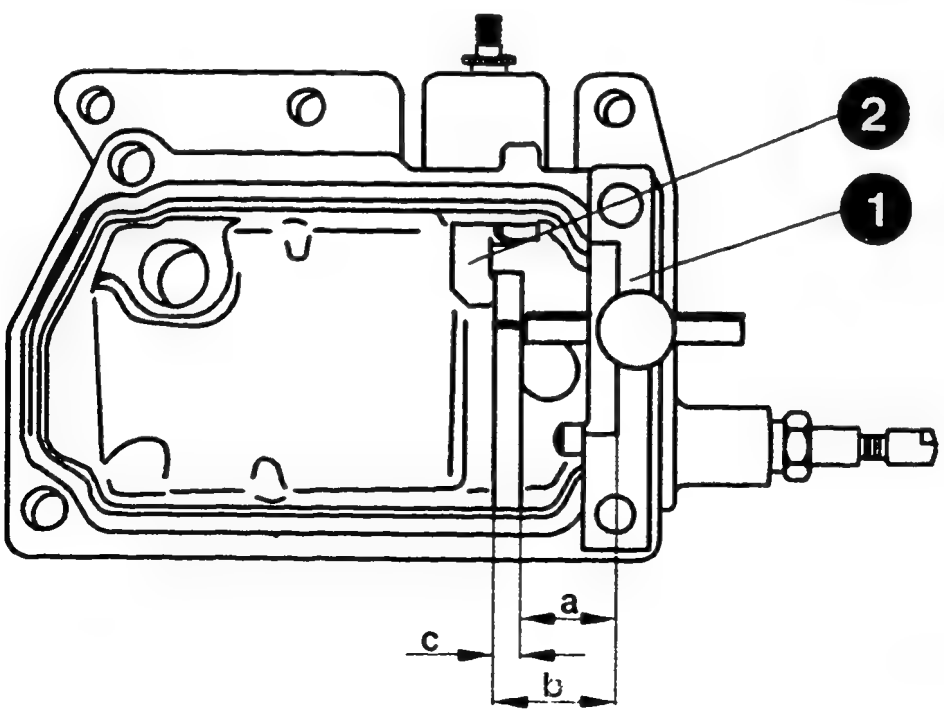
1 = Measurement tool
2 = Regulating lever

Attach KDEP 1152/3 to housing cover; determine and note down dimension "c" (thickness of measurement arm).

Calculate dimension "a" (a = b – c) and adjust measurement arm to this dimension.

Dimension "b" = 28.8 mm

Continue: J23/1 Fig.: J22/2




KMK02296

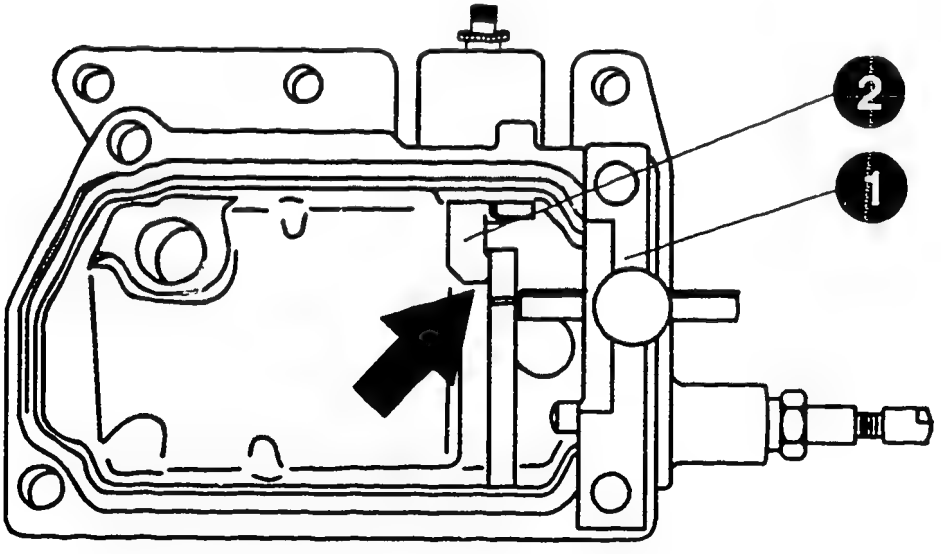
## ADJUSTING STOP/REGULATING LEVER

* With negative torque control

1 = Measurement tool
2 = Regulating lever

Clamp measurement tool KDEP 1152/3 in this position and press regulating lever against measurement arm (arrow).

Continue: J24/1 Fig.: J23/2




KMK02300

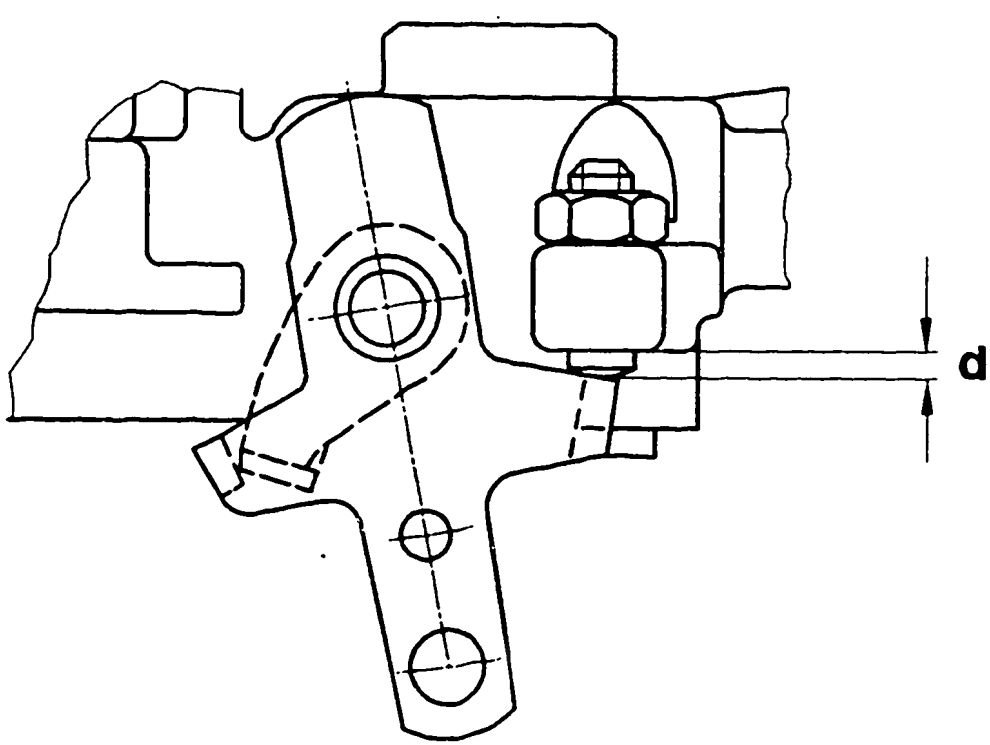
## ADJUSTING STOP/REGULATING LEVER

* With negative torque control

Position stop lever on setting-shaft toothing such that dimension "d" between lever and housing stop is as small as possible.

Engage spring.
Press stop lever in direction of housing stop and simultaneously tighten hexagon nut on setting shaft.
Tightening torque 5...10 Nm.

Continue: J25/1 Fig.: J24/2



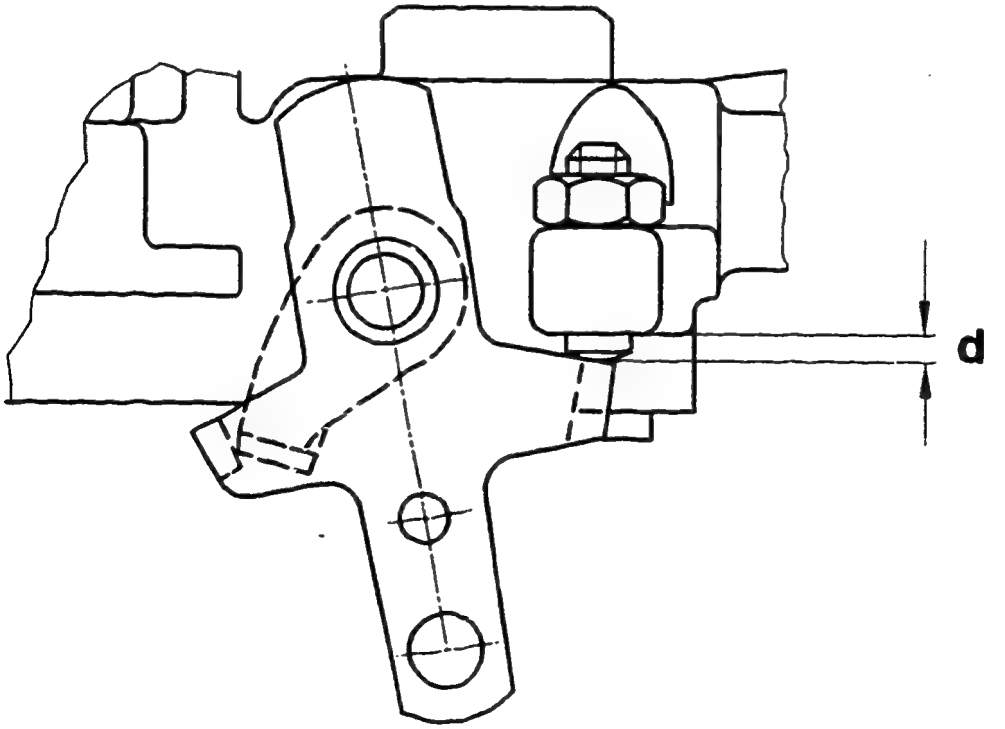

KMK02302

## ADJUSTING STOP/REGULATING LEVER

* With negative torque control

Close stop screw on stop lever (dimension "d") and tighten lock nut to tightening torque of 6...9 Nm.

Continue: J26/1 Fig.: J25/2




KMK02302

ADJUSTING POSITION OF DISTRIBUTOR-PUMP PLUNGER

Select adjustment in line with following characteristics:

* Distributor-type pump without prestroke
  Dimension "K" adjustment J27/1
* Quiet-running facility
  Dimension "K1" adjustment K03/1

Data in test-specification sheet under remarks

* Prestroke adjustment K09/1
  Data in test-specification sheet

Continue: J27/1

ADJUSTING POSITION OF DISTRIBUTOR-PUMP PLUNGER:

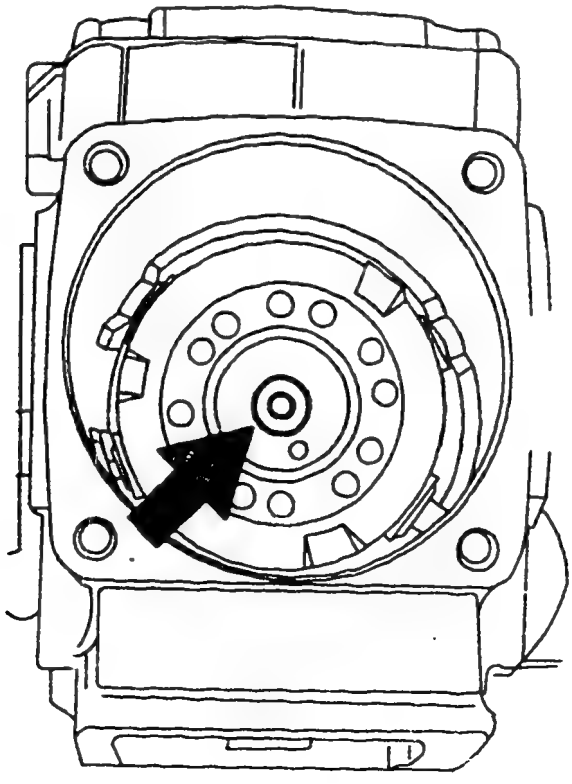
Arrow = Shim

Distributor-type pump without prestroke:

Dimension "K" is determined with KDEP 1088. Refer to data, dimension "K" in test-specification sheet. Insert arbitrary shim (dry) in base of plunger: do not stick on with grease or the like.

Continue: J28/1 Fig.: J27/2

KMK03417



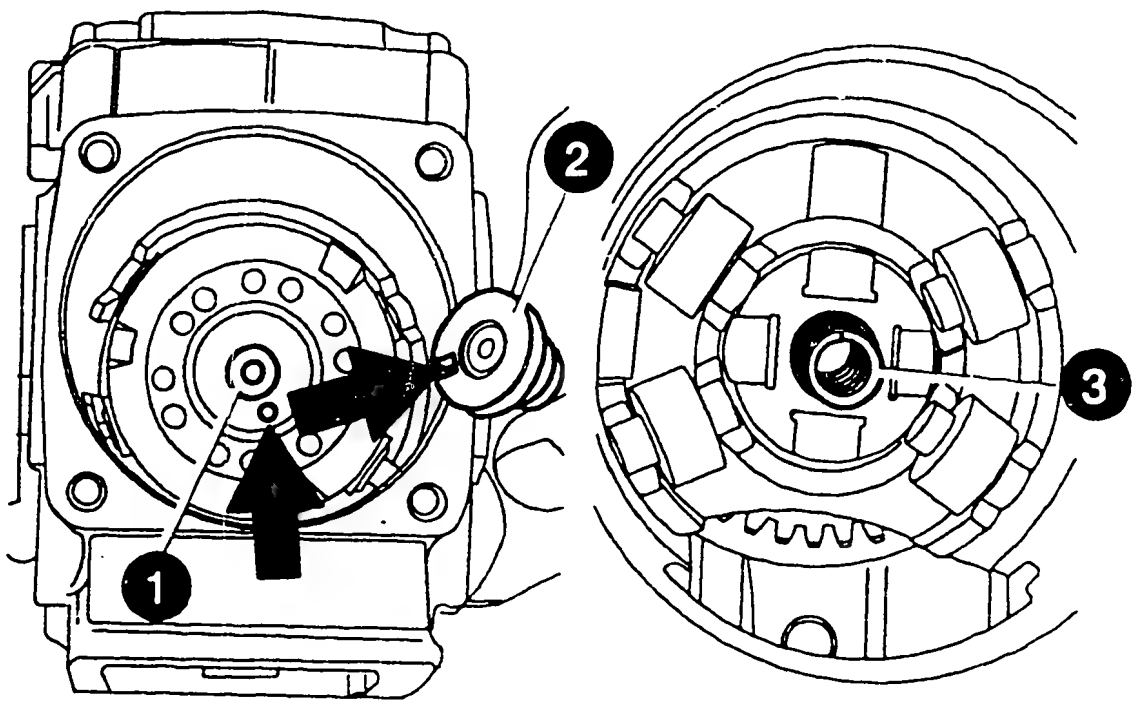
ADJUSTING POSITION OF DISTRIBUTOR-PUMP PLUNGER:

1 = Shim
2 = Base of distributor pump plunger
3 = Compression spring

NOTE
If compression spring is provided, it is not to be fitted.
Insert distributor-pump plunger with shim into cam plate such that driver pin of cam plate enters recess in bottom of plunger (arrows).

Continue: J29/1 Fig.: J28/2

KMK03418



## ADJUSTING POSITION OF DISTRIBUTOR-PUMP PLUNGER

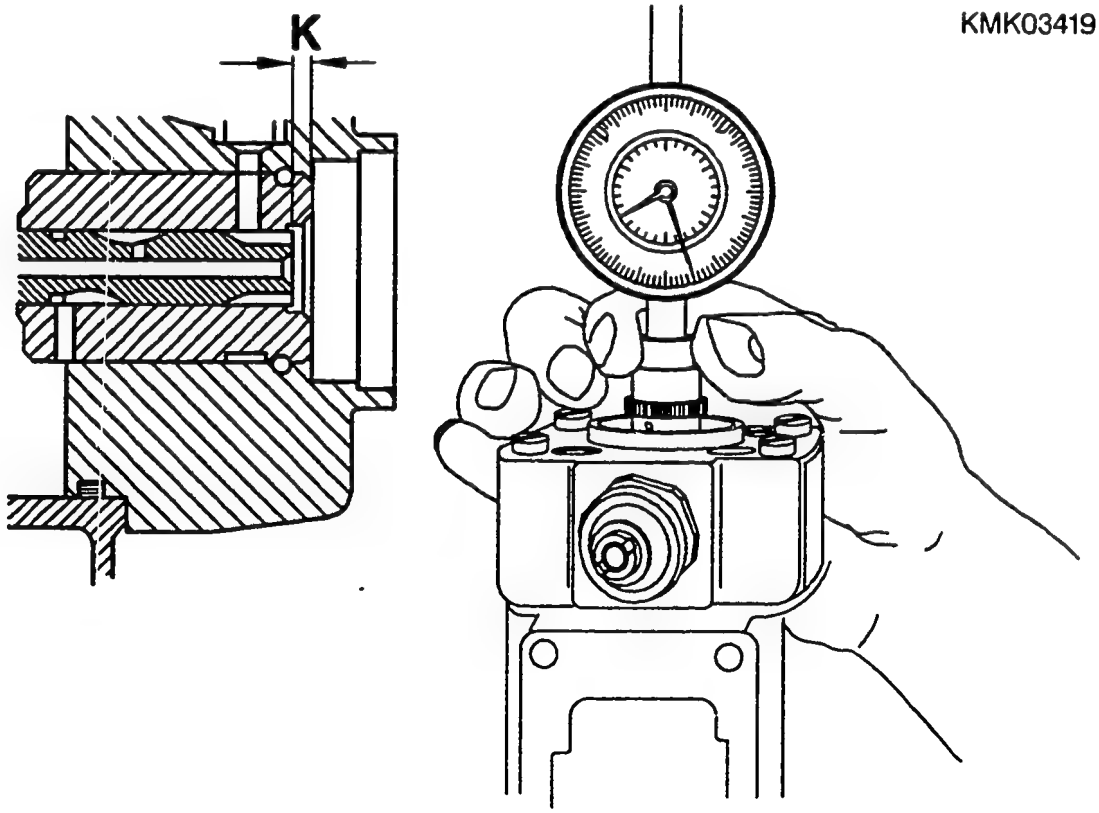
Insert distributor head carefully and without tilting over distributor-pump plunger into housing and secure with screws.

## DETERMINING PLUNGER DIMENSION (Dimension "K")

Dimension "K" is the distance between the end-face sealing surface of the distributor head and the end face of the distributor-pump plunger.

Move distributor-pump plunger to UT position.

Continue: K02/1 Fig.: K01/2



ADJUSTING POSITION OF DISTRIBUTOR-PUMP PLUNGER:

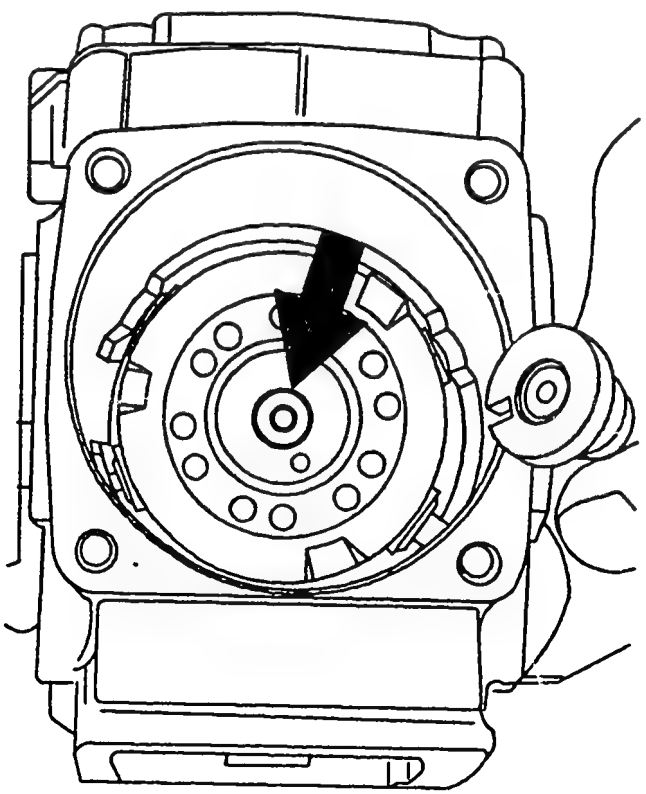
Determining dimension "K"

Compare measured dimension (red dial-indicator numbers) to desired dimension "K" given in test-specification sheet and effect compensation with appropriate shim (arrow) in bottom of plunger.

If the measured dimension is greater than the prescribed desired dimension "K", a thicker shim must be fitted; a thinner shim is required if the situation is vice-versa.
Then re-check dimension "K".

Continue: K22/1 Fig.: K02/2

KMK03420



## ADJUSTING QUIET-RUNNING FACILITY

### DETERMINING DIMENSION "K1"

The previous dimension to be set, namely "K", is superseded on these pumps by the dimension "K1". There are then neither data under dimension "k" nor under "prestroke" in the test-specification sheet. The dimension "K1" is therefore marked beneath the solenoid valve in the distributor head (arrow).

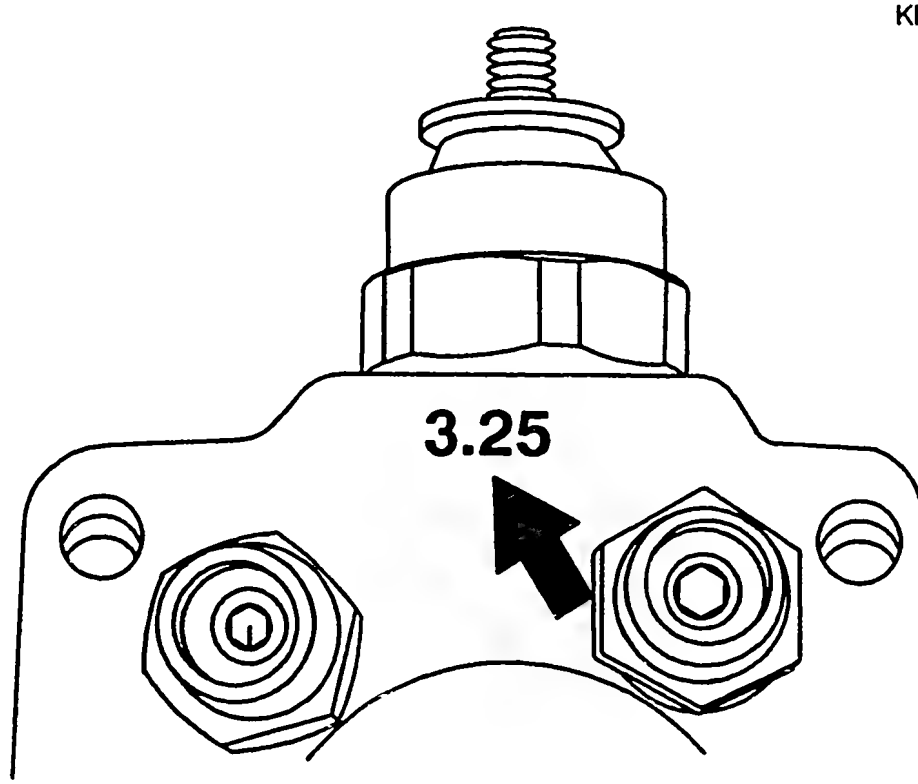
EXAMPLE

Marked number = 3.25

DIMENSION "K1" = 3.25 mm

Continue: K04/1 Fig.: K03/2

KMK03421



## ADJUSTING QUIET-RUNNING FACILITY

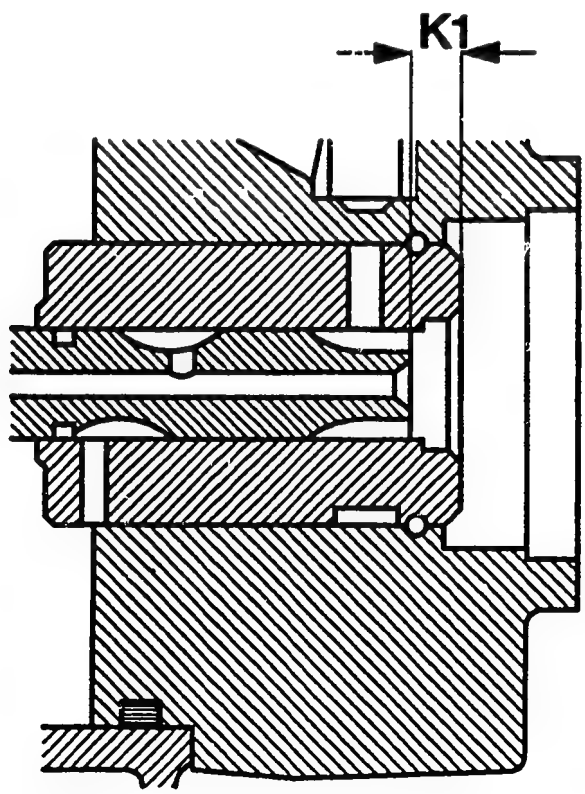
### DETERMINING DIMENSION "K1"

The dimension "K1" is the distance between the end-face sealing surface of the distributor head and the end face of the distributor-pump plunger.

Move distributor-pump plunger to UT position.

Continue: K05/1 Fig.: K04/2

KMK03422



## ADJUSTING QUIET-RUNNING FACILITY

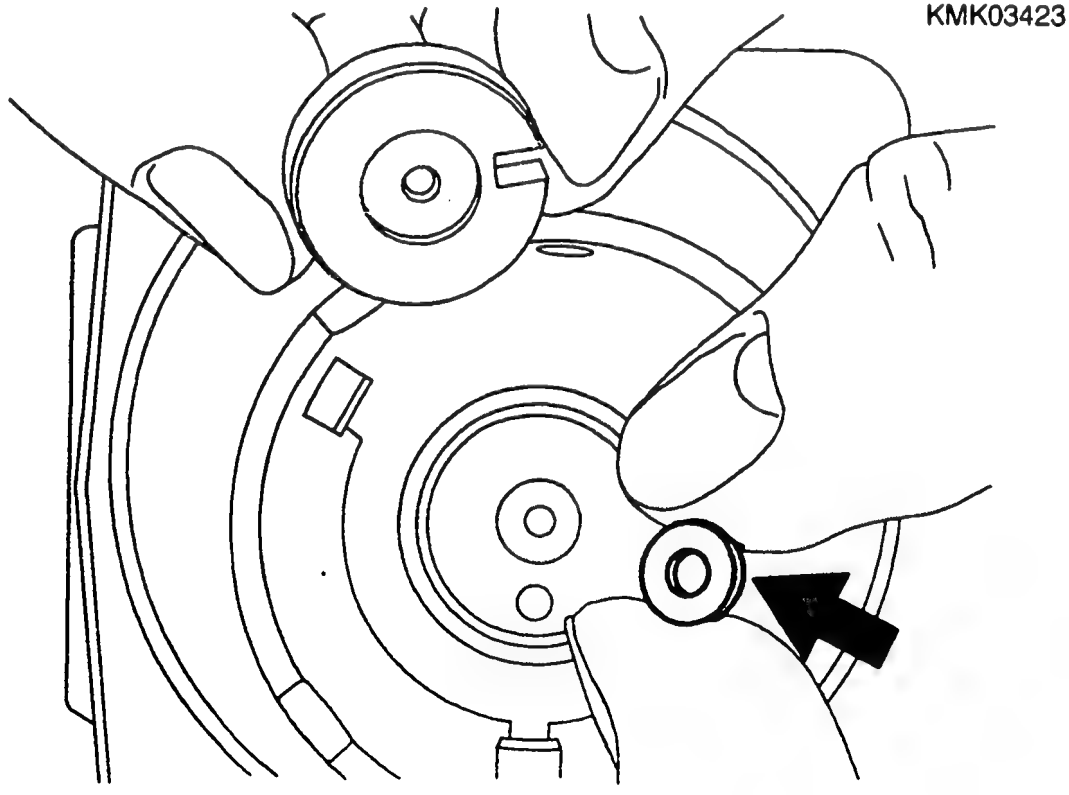
### DETERMINING DIMENSION "K1"

Arrow = Shim

Insert any shim (dry) in base of plunger. Do not bond on with grease or the like.

Note:
If there is a compression spring beneath the cam plate, it is not to be fitted.

Continue: K06/1 Fig.: K05/2



ADJUSTING QUIET-RUNNING FACILITY

1 = Shim

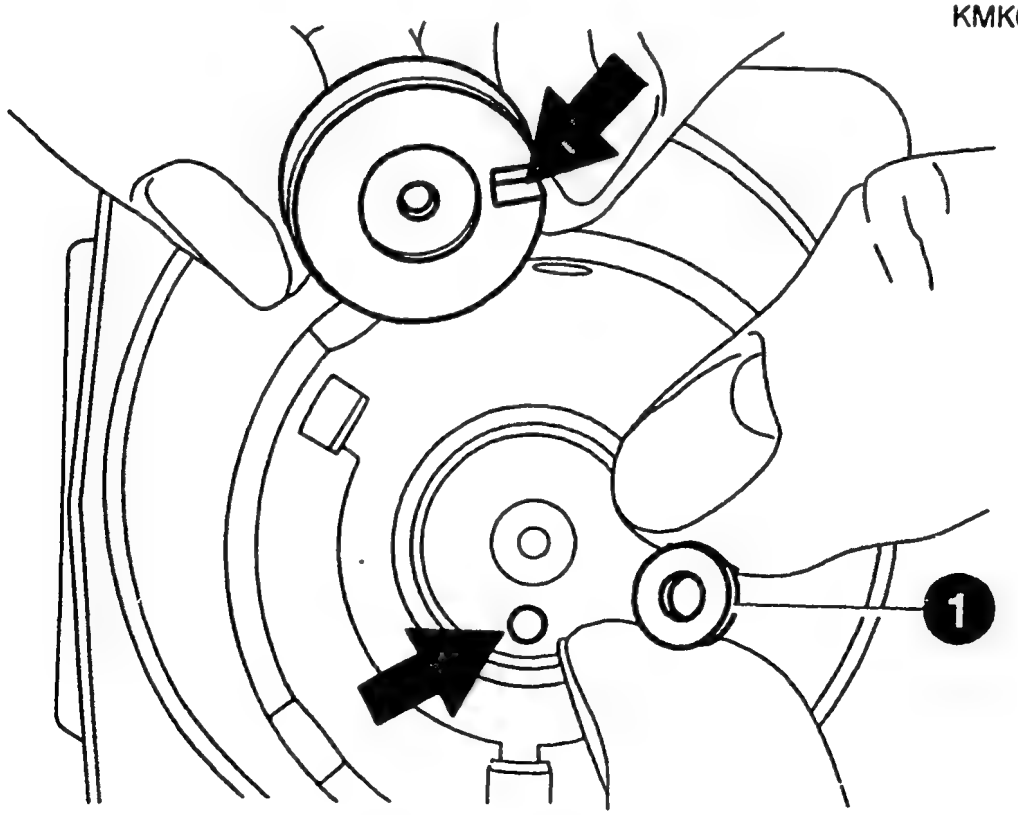
DETERMINING DIMENSION "K1"

Insert distributor-pump plunger with shim in cam plate such that driver pin of cam plate enters recess at bottom of plunger (arrows).

Insert distributor head carefully and without tilting over distributor-pump housing into housing and secure with fastening screws.

Continue: K07/1 Fig.: K06/2

KMK03424



## ADJUSTING QUIET-RUNNING FACILITY

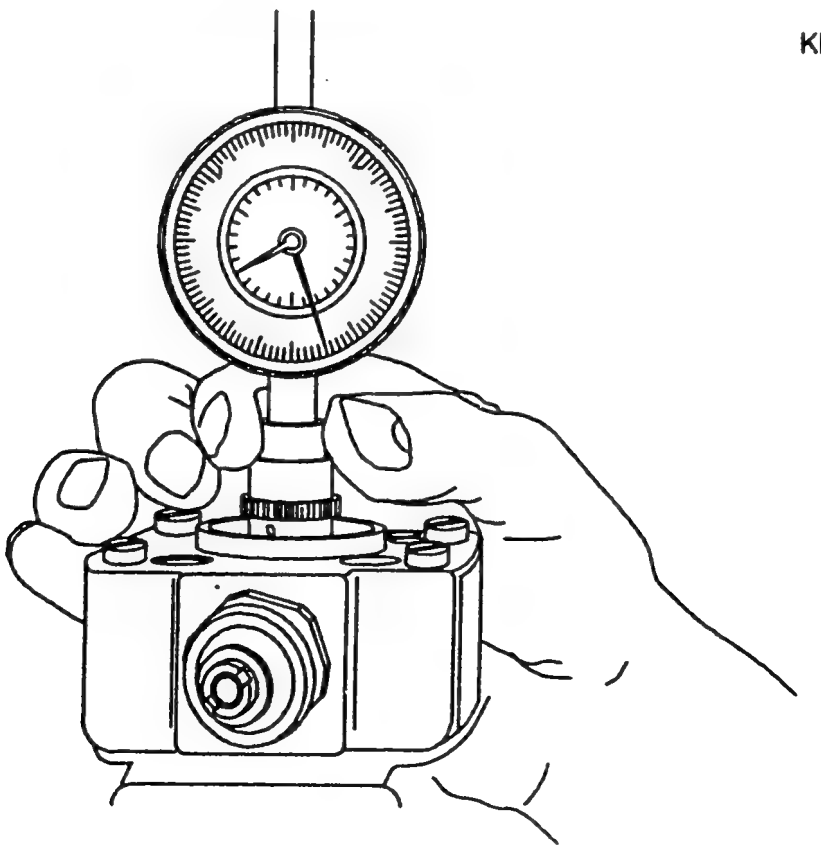
### DETERMINING DIMENSION "K1"

The dimension "K1"is measured with KDEP 1088.

Compare measured dimension (red dial-indicator numbers) to desired dimension "K1" marked in distributor head and effect compensation with appropriate shim in bottom of plunger.

Continue: K08/1 Fig.: K07/2

KMK03425



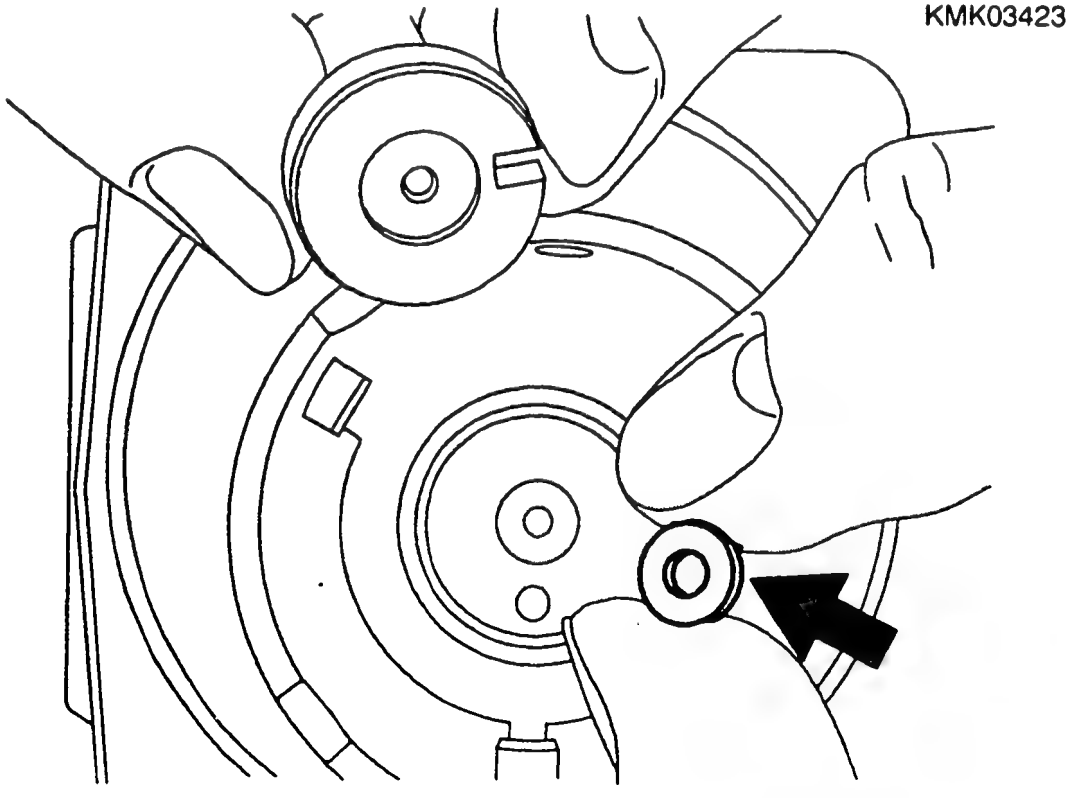
ADJUSTING QUIET-RUNNING FACILITY

Arrow = Shim

DETERMINING DIMENSION "K1"

If the measured dimension is greater than the prescribed desired dimension "K1" a thinner shim must be added. Then re-check dimension "K1".

Continue: K22/1 Fig.: K08/2



ADJUSTING PRESTROKE

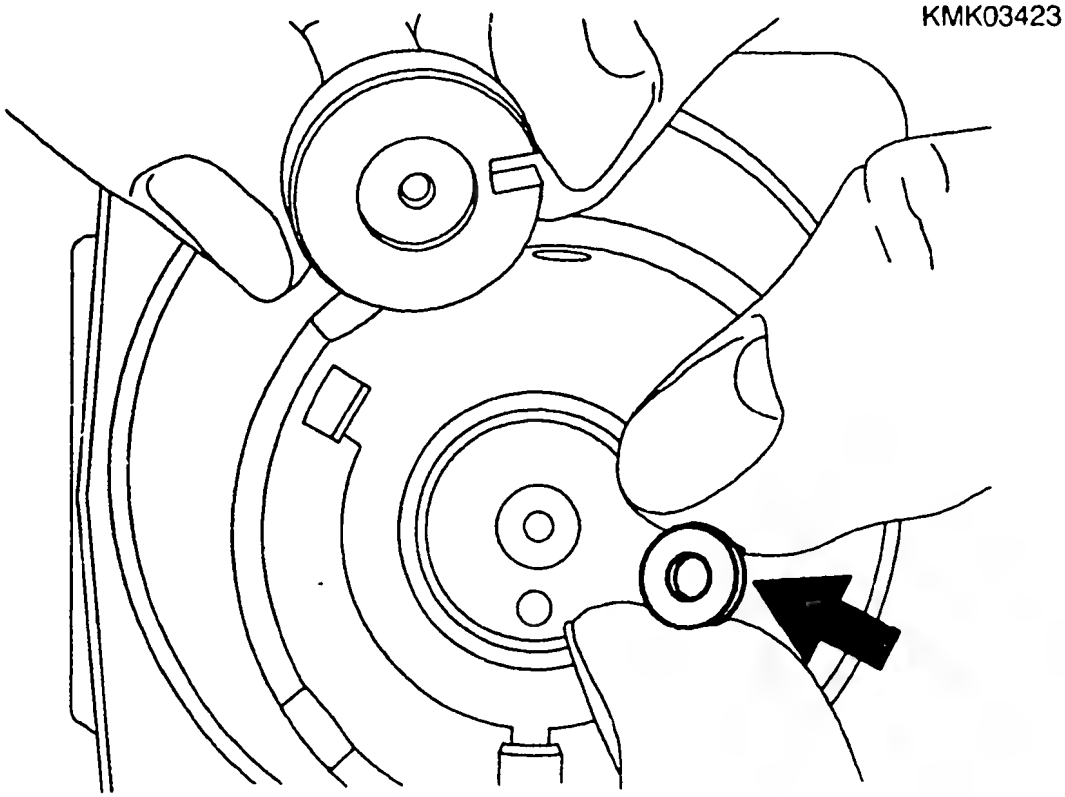
1 = Shim

Refer to test-specification
sheet for data

The measurement is performed
hydraulically on the test bench.
Insert any shim (dry)
in bottom of plunger.
Do not bond on with grease or the like.

Note:
If there is a compression spring,
it is not to be installed!

Continue: K10/1 Fig.: K09/2



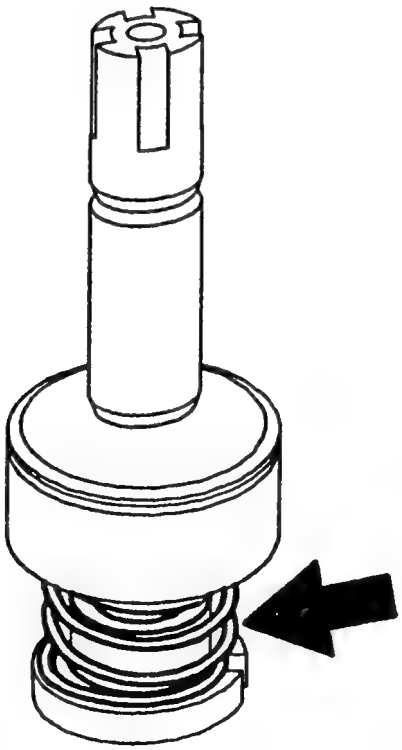
## ADJUSTING PRESTROKE

Insert distributor-pump plunger with shim into cam plate such that driver pin of cam plate enters recess in bottom of plunger.

There must be an auxiliary compression spring (arrow) fitted between bottom of plunger and spool to ensure that spool is always pressed against distributor head during measurement. Position spool on plunger.

Continue: K11/1 Fig.: K10/2

KMK03426

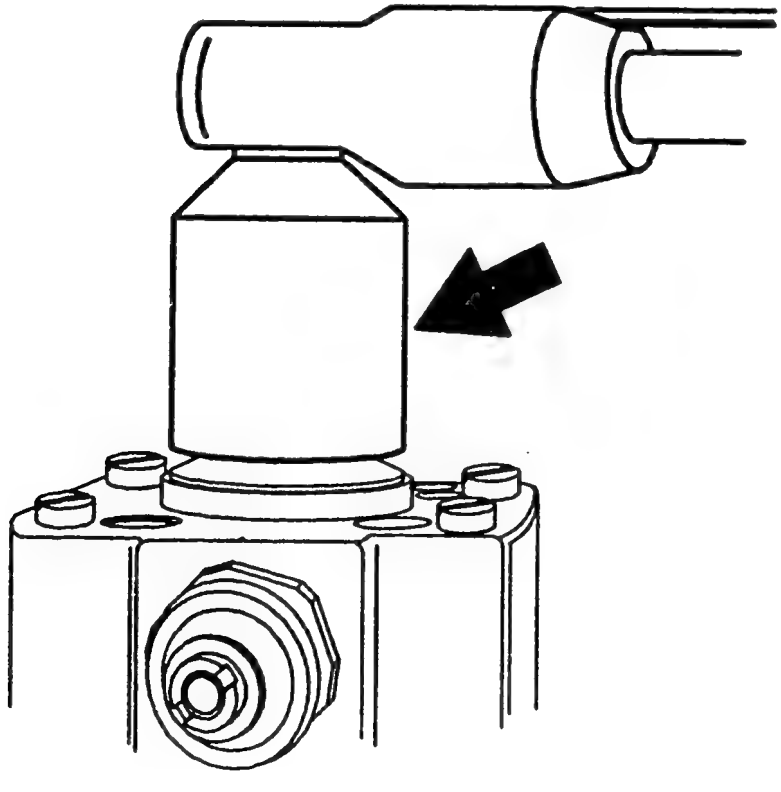


## ADJUSTING PRESTROKE

Insert distributor head carefully and without tilting over distributor-pump plunger into housing and secure with screws.
Screw NEW central screw plug with seal ring into distributor head with wrench KDEP 1080.
Tightening torque 60 ... 80 Nm

Continue: K12/1 Fig.: K11/2

KMK03427



## ADJUSTING PRESTROKE

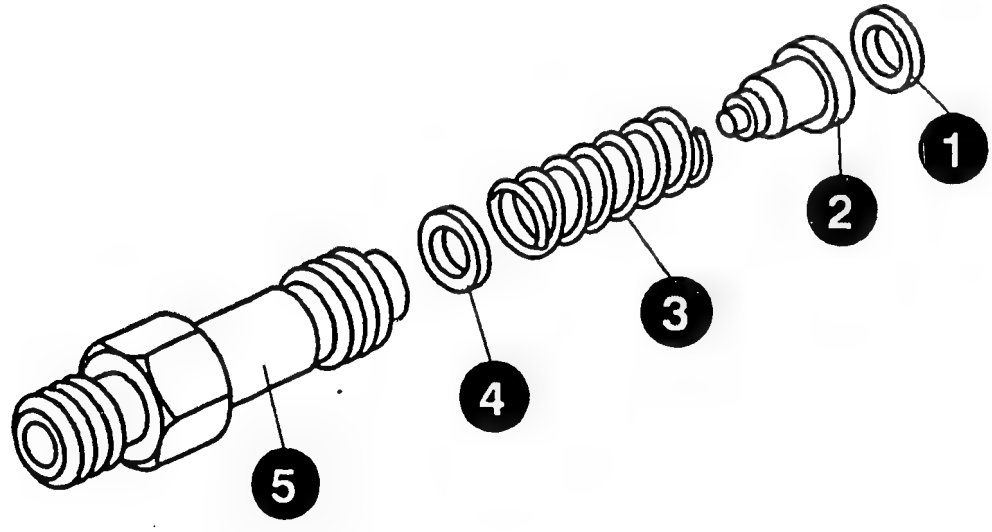
* Installing delivery-valve assemblies

1 = Gasket
2 = Delivery-valve assembly
3 = Delivery-valve spring
4 = Shim
5 = Delivery-valve holder

Install delivery-valve assembly with gasket, delivery-valve spring, shim and fitting in distributor head.
The tightening torque for delivery-valve holders already used is:
38 ... 48 Nm.

Continue: K13/1 Fig.: K12/2

KMK03428



ADJUSTING PRESTROKE

* Installing delivery-valve assemblies
The tightening torque for new delivery-valve holders screwed into a new distributor head is: 38 ... 48 Nm.
Removed (deformed) delivery-valve holders may only be re-used if:

* Sealing edge not damaged, cracked or chipped
* Bezel at sealing edge only slightly deformed without visible shoulder
* Valve holders are not siezed in position in delivery-valve holders

Continue: K13/2

ADJUSTING PRESTROKE

Provisionally screw governor shaft with O-ring and slotted shoulder screws (as per service-parts list) into housing with flat seal ring.
Provisionally fit assembled housing cover with fillister-head screws.

Seal open tapped holes in housing cover with screw plugs.

Continue: K14/1

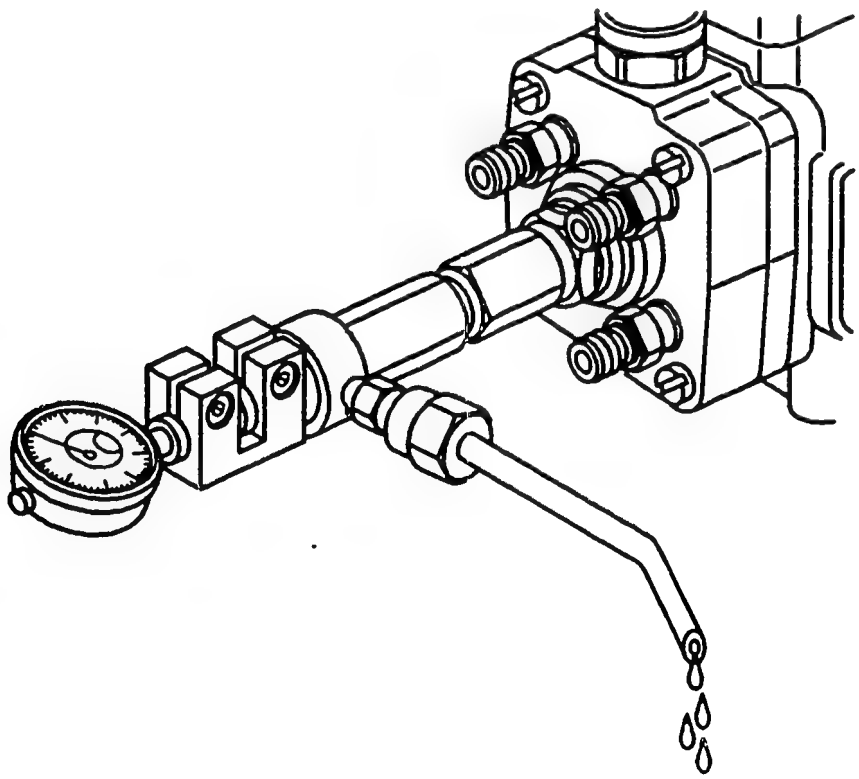
## ADJUSTING PRESTROKE

Screw prestroke measuring device (1 688 130 180) and dial indicator 1 687 233 012 into central screw plug. Initially tension dial indicator 4 mm in UT position of distributor-pump plunger.

Unclamp distributor-type fuel-injection pump from clamping support and clamp it to clamping bracket of injection-pump test bench.

Continue: K15/1 Fig.: K14/2

KMK03429



ADJUSTING PRESTROKE

NOTE:

Do not swivel VE pump into horizontal position with prestroke measuring device fitted as otherwise there would be a danger of prestroke disk and rollers falling out.
Attach drive coupling.

Continue: K15/2

ADJUSTING PRESTROKE

Attach distributor-type fuel-injection pump to test bench such that coupling is subjected to tensile stress.
In other words secure drive coupling of distributor-type fuel-injection pump in no-play coupling of test bench.
Loosen fastening screw of clamping bracket and pull bracket with clamped-on pump away from drive.
Tighten fastening screw at the same time.

Continue: K16/1

ADJUSTING PRESTROKE

Connect up calibrating-oil inlet hose. Connect up solenoid valve (pulling electromagnet) to voltage source 12/24 V (0 V with pushing electromagnet). Switch on injection-pump test bench and set inlet pressure of 400 hPa. Turn distributor-pump plunger to UT position and set dial indicator to "0" (calibrating oil emerges at overflow pipe of measuring device).

Continue: K16/2

ADJUSTING PRESTROKE

Slowly turn drive shaft in direction of rotation until start of delivery is attained.

Start of delivery has been attained if 1 drop per second flows out at overflow pipe (arrow).

For more precise measurement measure droplets over a period of several seconds, e.g. 15 drops in 15 seconds.

Continue: K17/1

## ADJUSTING PRESTROKE

Read off measured value and compare to "prestroke setting" as per test-specification sheet.

If prestroke setting is correct, continue as per Coordinate K22/1

Correct deviation by way of appropriate shim beneath bottom of plunger.
To do so, remove distributor-type fuel-injection pump from test bench, secure in position in clamping frame, remove housing cover and distributor head.

Continue: K18/1

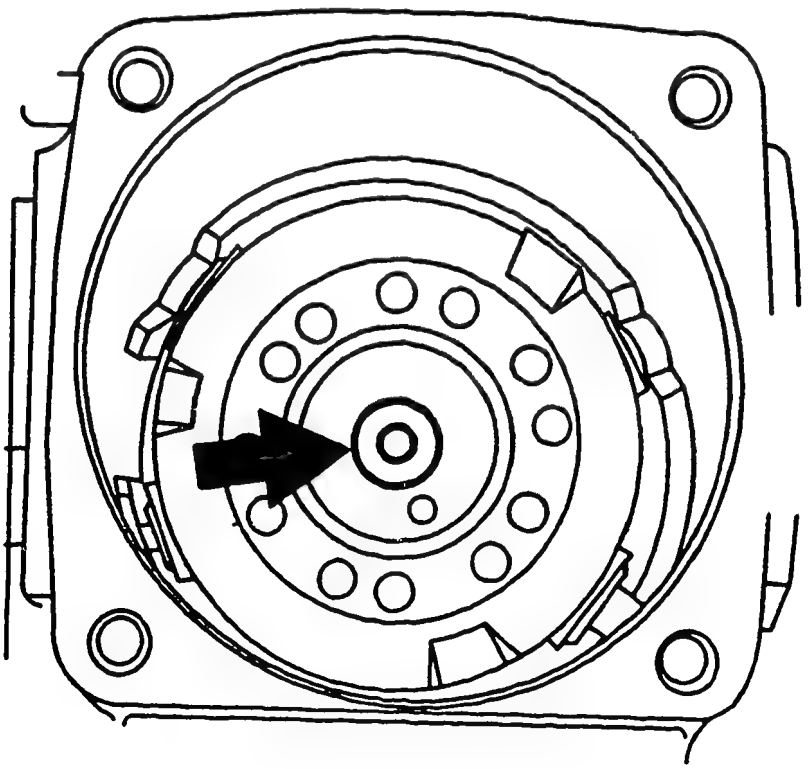
ADJUSTING PRESTROKE

Arrow = Shim

If the prestroke is too large, insert thicker shim; insert thinner shim if prestroke is too small. If selection is such that requirement is between 2 shim thicknesses, choose thicker shim.
Re-install distributor head and housing cover and perform prestroke check measurement.

Continue: K19/1 Fig.: K18/2

KMK03430



ADJUSTING POINTER AT ADJUSTMENT WINDOW
(FOR SETTING PUMP WITH RESPECT TO
ENGINE AS PER "POINTER METHOD")

* Pump with no pointer: continue on
  Coordinate K22/1

Such adjustment is to be performed
if a plunger stroke is given on the
test-specification sheet for
prestroke adjustment.

Switch off test bench following
completion of prestroke adjustment.
Do not remove fuel-injection pump.
Remove cover from adjustment window.
Turn drive shaft in direction of pump
rotation until mark on cam plate is
visible.

Continue: K20/1

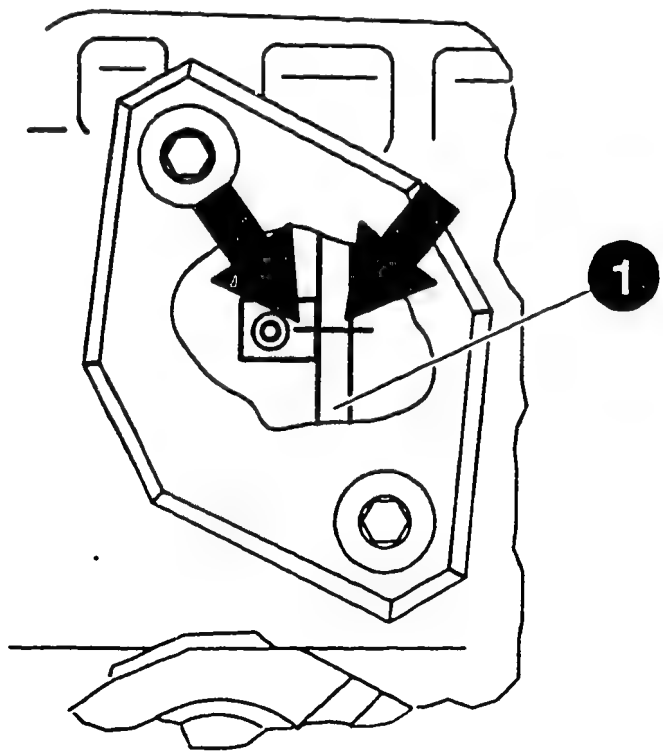
ADJUSTING POINTER AT ADJUSTMENT WINDOW
(FOR SETTING PUMP WITH RESPECT TO
ENGINE AS PER "POINTER METHOD")

1 = Cam plate

Woodruff-key groove of drive shaft points towards delivery outlet. Slowly continue turning drive shaft until stroke as per test-specification sheet has been obtained. In this position, cause pointer to coincide with mark on cam plate (arrows).
Turn back drive shaft and cause setting to coincide.
Turn back drive shaft and check setting again.

Continue: K21/1 Fig.: K20/2

KMK03399



ADJUSTING POINTER AT ADJUSTMENT WINDOW
(FOR SETTING PUMP WITH RESPECT TO
ENGINE AS PER "POINTER METHOD")

Fit closing cover of adjustment window.
Remove prestroke measuring device and
detach fuel-injection pump from test
bench.

Continue: K22/1

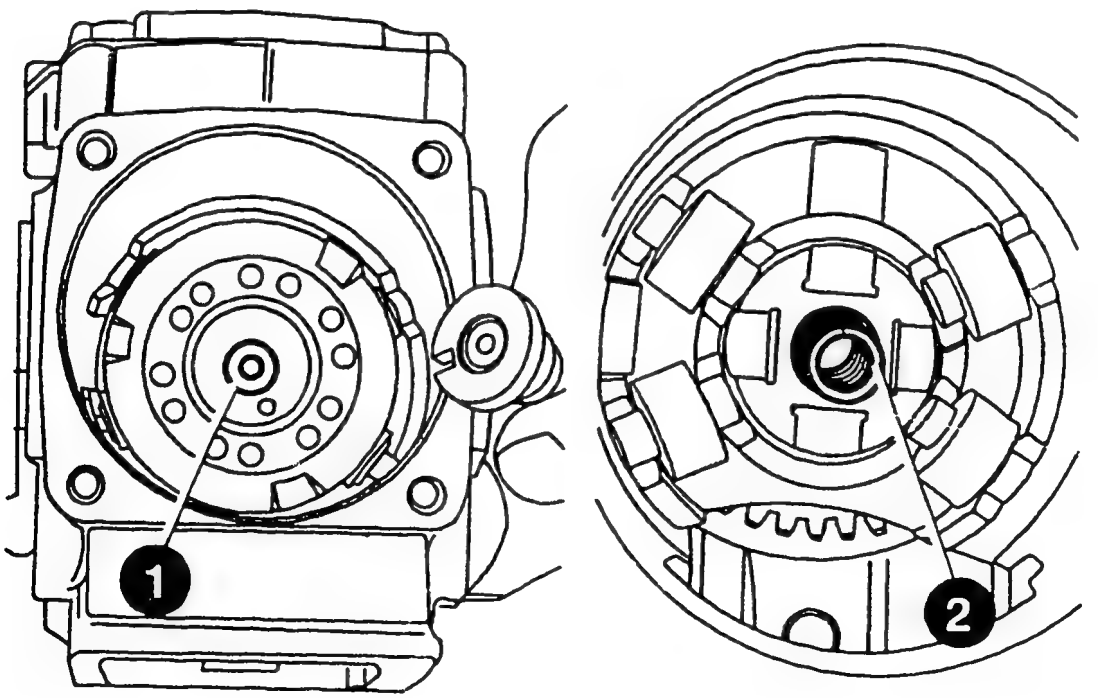
## INSTALLING FULCRUM LEVER ASSEMBLY

1 = Shim
2 = Compression spring

Remove drive coupling.
Remove prestroke measuring device and take out distributor head with distributor-pump plunger and calibrated shim. Check freedom of movement of distributor-pump plunger.
Unscrew housing cover, screw out governor shaft and slotted shoulder screws. If applicable, remove part-load governor. Where provided, insert compression spring between slotted washer and cam plate.

Continue: K23/1 Fig.: K22/2

KMK03431



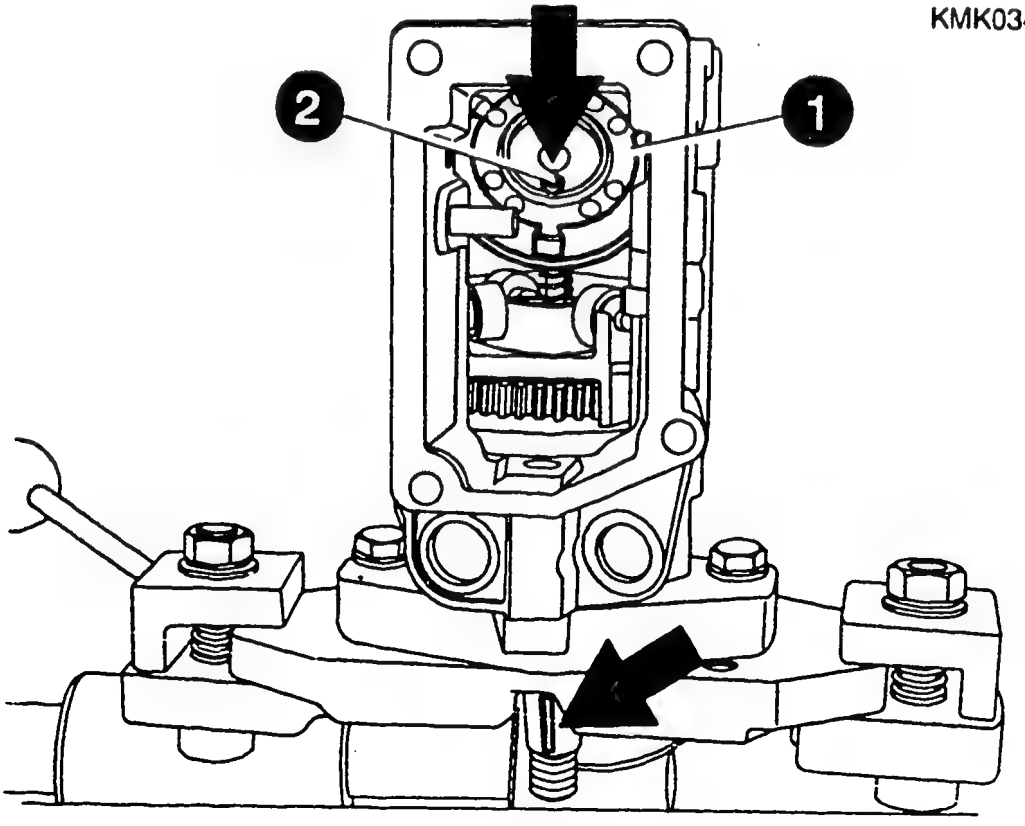
## INSTALLING FULCRUM LEVER ASSEMBLY

1 = Cam plate
2 = Driver pin

Insert cam plate such that driver pin faces in direction of Woodruff-key groove (arrow) of drive shaft.

Continue: K24/1 Fig.: K23/2

KMK03432



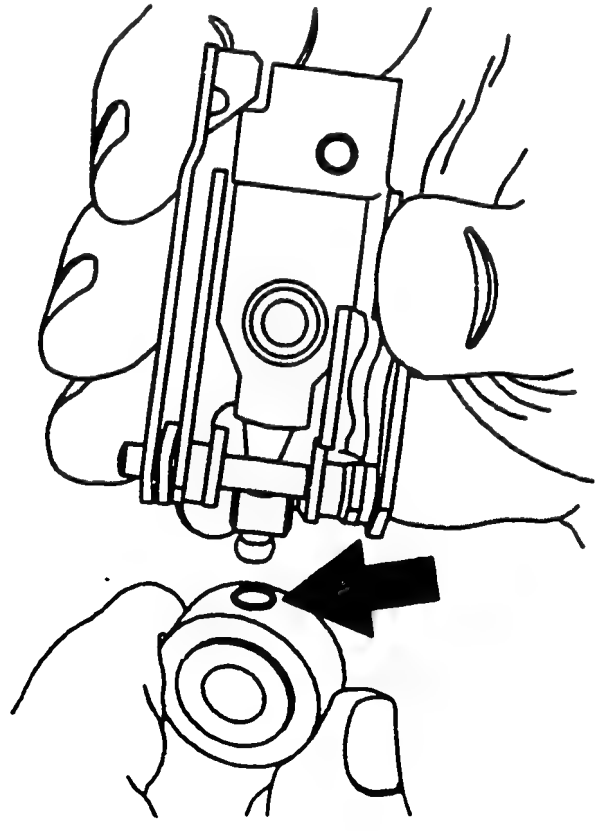
## INSTALLING FULCRUM LEVER ASSEMBLY

Insert ball stud of fulcrum lever assembly in control-spool hole (arrow).

If fit is not tight or ball stud sticks, renew fulcrum lever assembly/distributor head.

Continue: K25/1 Fig.: K24/2

KMK03363

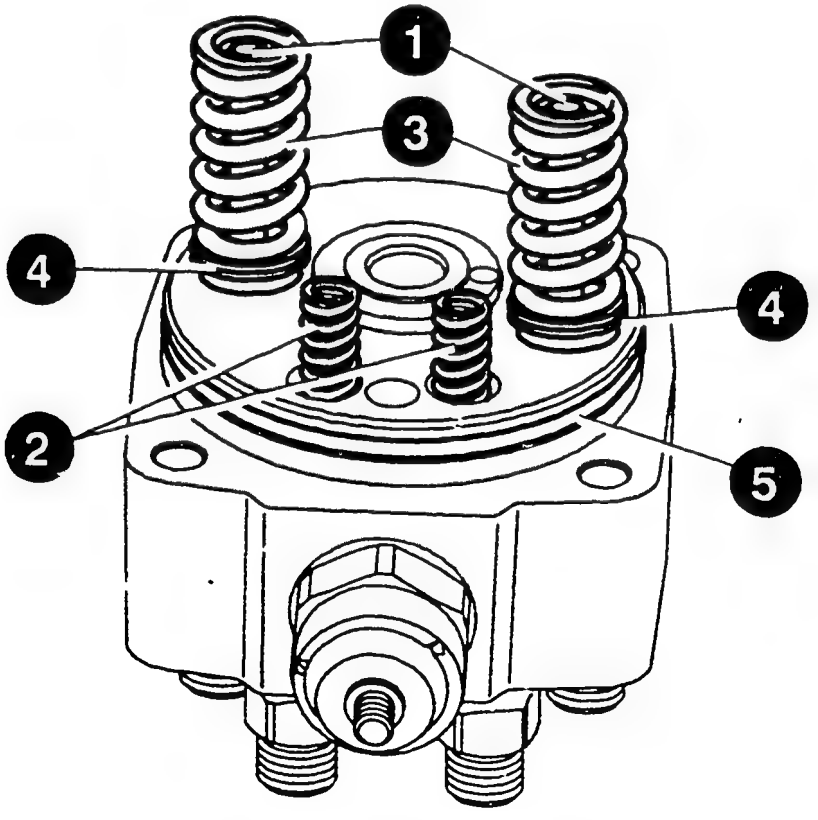


## INSERTING DISTRIBUTOR HEAD

1 = Guide pins
2 = Compression springs
3 = Compression springs
4 = Spacers
5 = O-ring

Fit O-ring on distributor head. Insert guide pins, calibrated spacer (dimension KF) and spring seat with grease in distributor head. "Bond in" compression springs (small) with grease in distributor head.
Attach compression spring (large) to guide pins.

Continue: K26/1 Fig.: K25/2



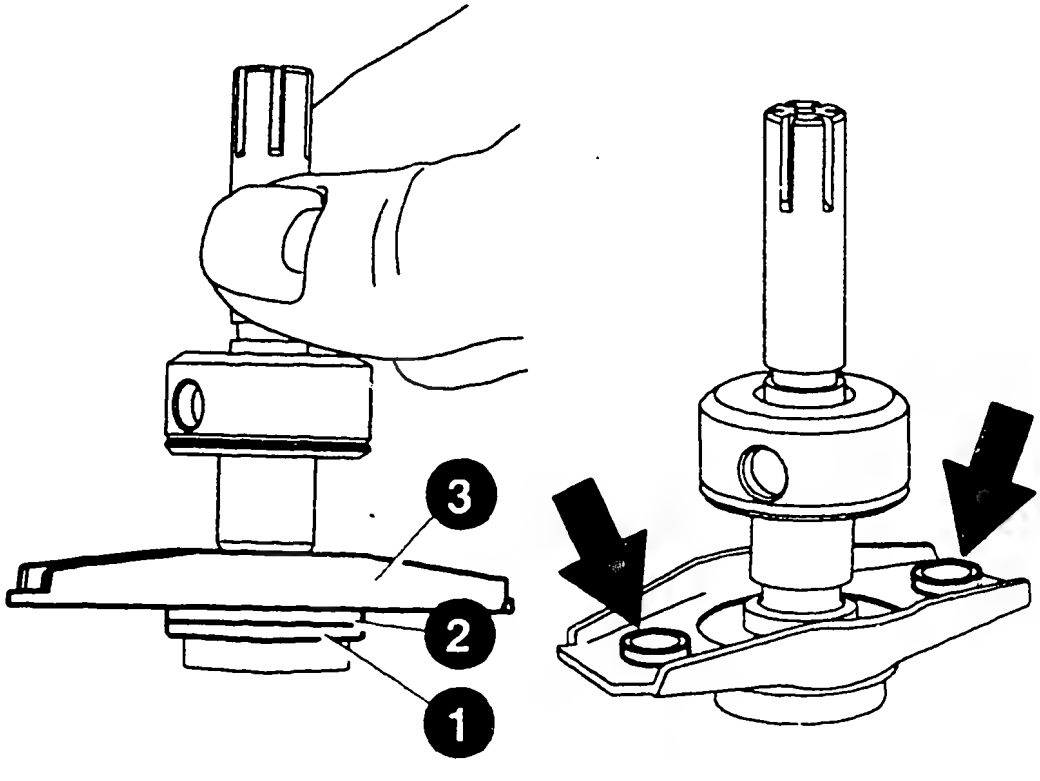
## INSERTING DISTRIBUTOR HEAD

1 = Shim
2 = Slotted washer
3 = Spring seat

Attach shim, slotted washer and spring seat (spring guide faces upwards, arrows) to distributor-pump plunger.

Continue: K27/1 Fig.: K26/2

KMK03435



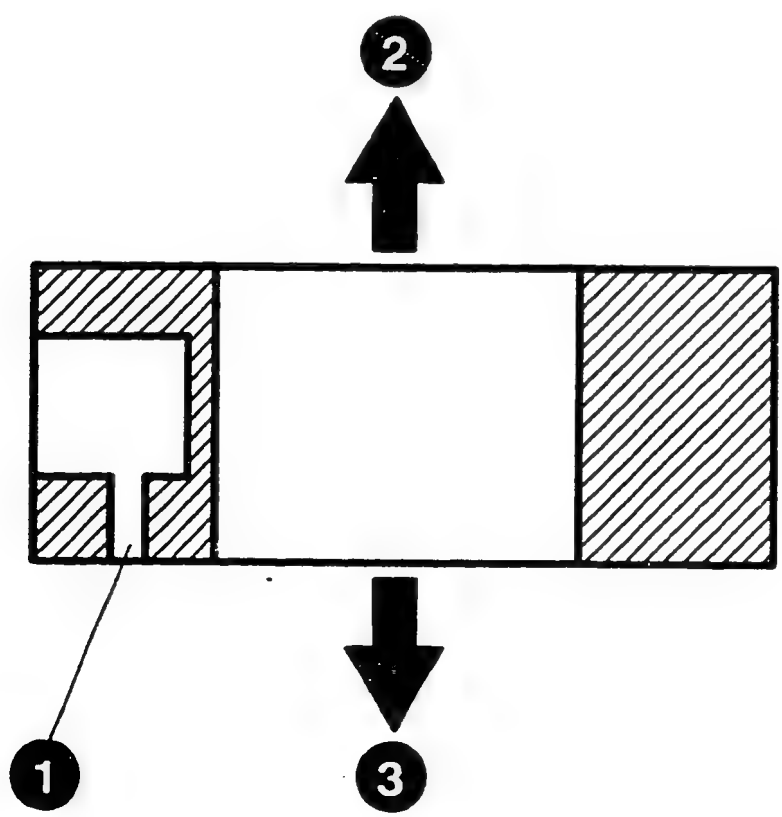
## INSERTING DISTRIBUTOR HEAD

1 = Scavenging hole
2 = Distributor head side
3 = Cam plate side

Slip control spool onto distributor-pump plunger such that scavenging hole faces cam plate (bottom of plunger).

Continue: K28/1 Fig.: K27/2

KMK03436



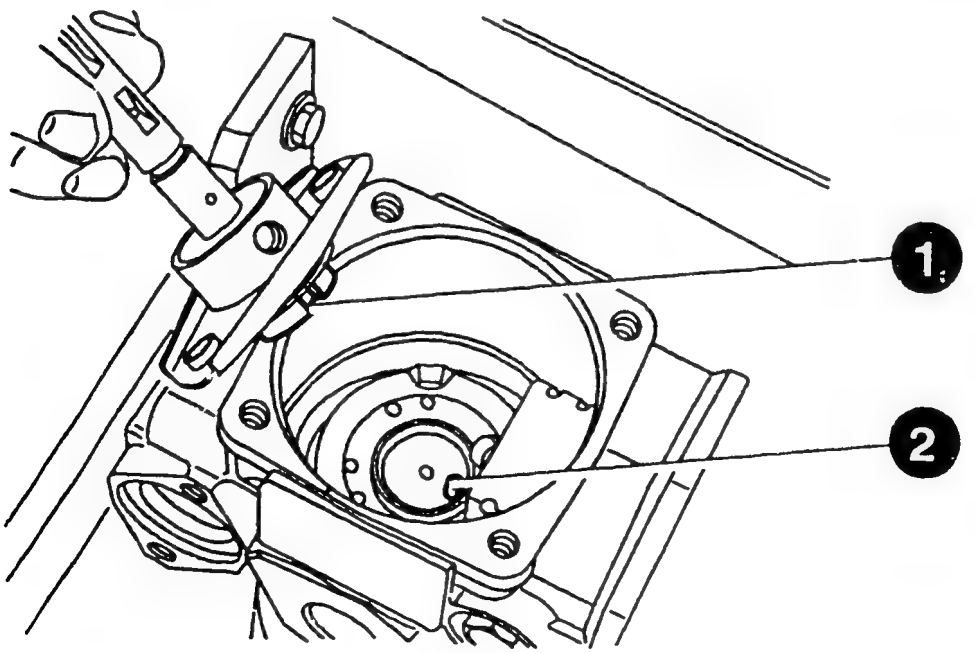
## INSERTING DISTRIBUTOR HEAD

1 = Recess in bottom of plunger
2 = Driver pin

Use grease to bond in calibrated shim beneath bottom of plunger.
Insert complete distributor-pump plunger in pump housing.
Insert driver pin of cam plate into groove in distributor-pump plunger.

Continue: L01/1 Fig.: K28/2

KMK03437



## INSERTING DISTRIBUTOR HEAD

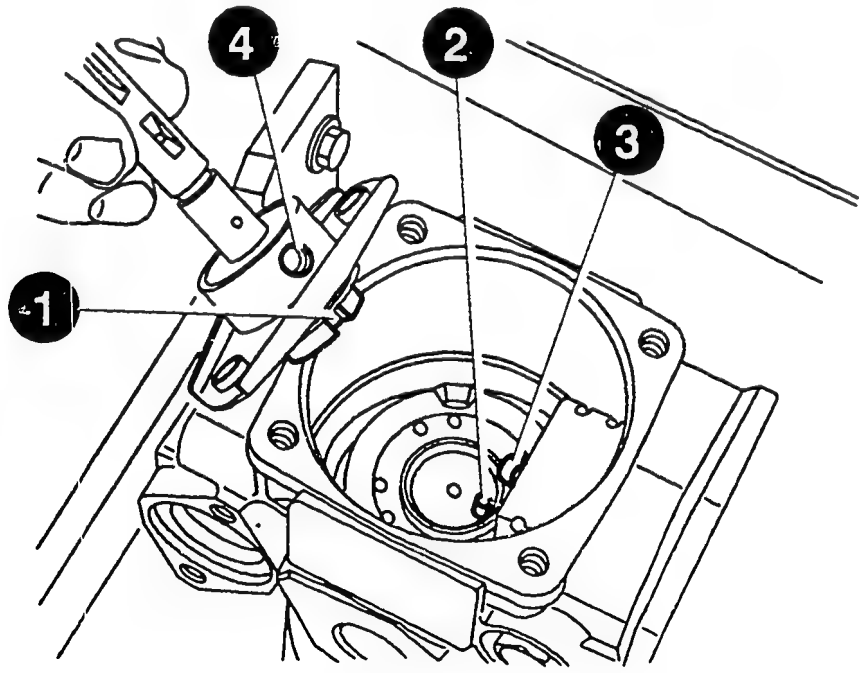
1 = Nut
2 = Driver pin
3 = Spherical bolt
4 = Control-spool hole

Insert spherical bolt of fulcrum lever assembly in control-spool hole.

NOTE
Driver pin and groove in distributor-pump plunger face towards housing cover.

Continue: L02/1 Fig.: L01/2

KMK03438

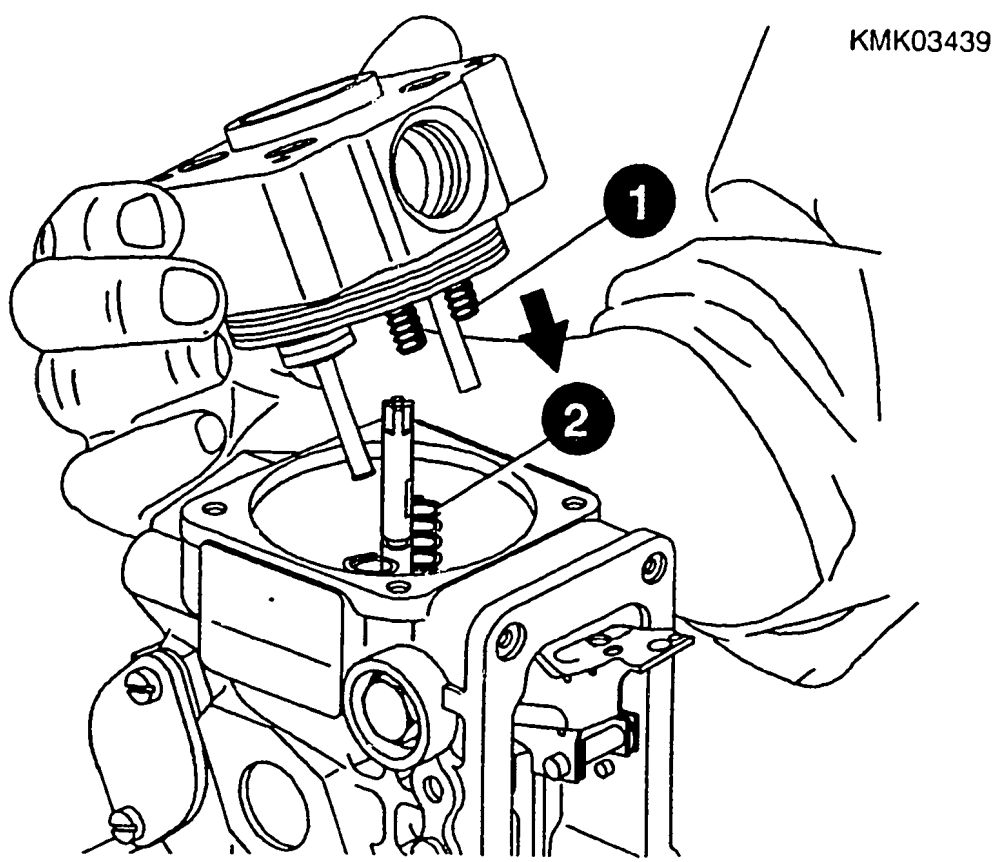


## INSERTING DISTRIBUTOR HEAD

1 = Compression spring
2 = Plunger springs

Position plunger springs on spring seat. Attach preassembled distributor head to pump housing.
Compression springs face fulcrum lever assembly.
Take care not to damage O-ring between pump housing and distributor head.

Continue: L03/1 Fig.: L02/2



## INSERTING DISTRIBUTOR HEAD

After inserting distributor head, check whether guide pin ends are properly positioned in guide holes in spring seat.
Likewise check that spherical bolt of fulcrum lever assembly is in control-spool hole.

Continue: L04/1

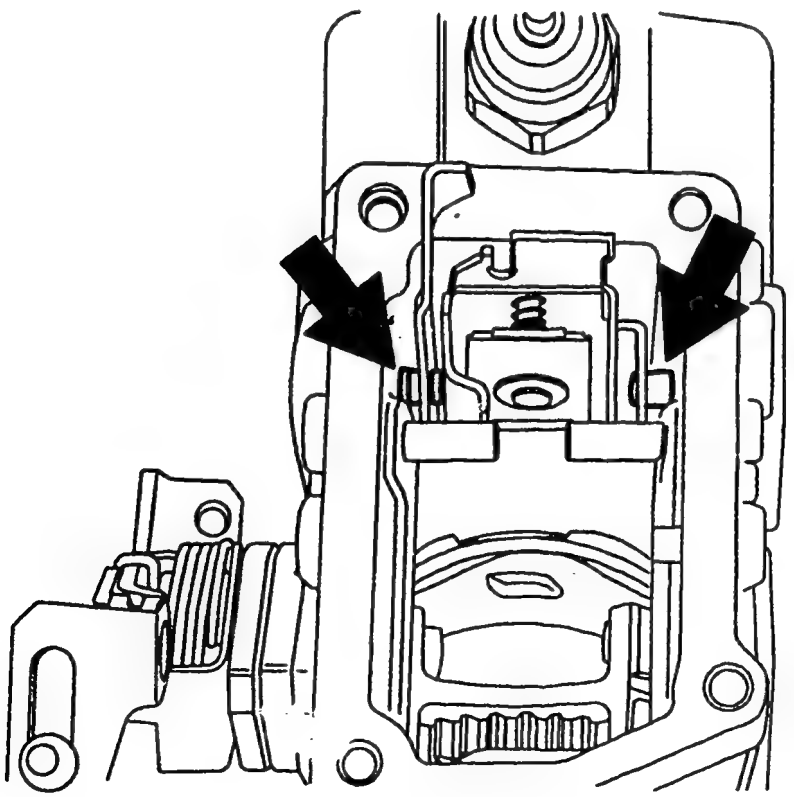
## INSERTING DISTRIBUTOR HEAD

Loosely insert fastening screws of distributor head as guide.

Screw fulcrum lever assembly with slotted shoulder screws (arrows) and seal ring into housing.
Tighten distributor head to prescribed tightening torque.
Fillister-head hexagon-socket-head cap screw 7...10 Nm
Torx bolt 10...14 Nm
Attach support plate (in the case of pump with no TAS).

Continue: L05/1 Fig.: L04/2

KMK03440



## INSTALLING MECHANICAL GOVERNOR

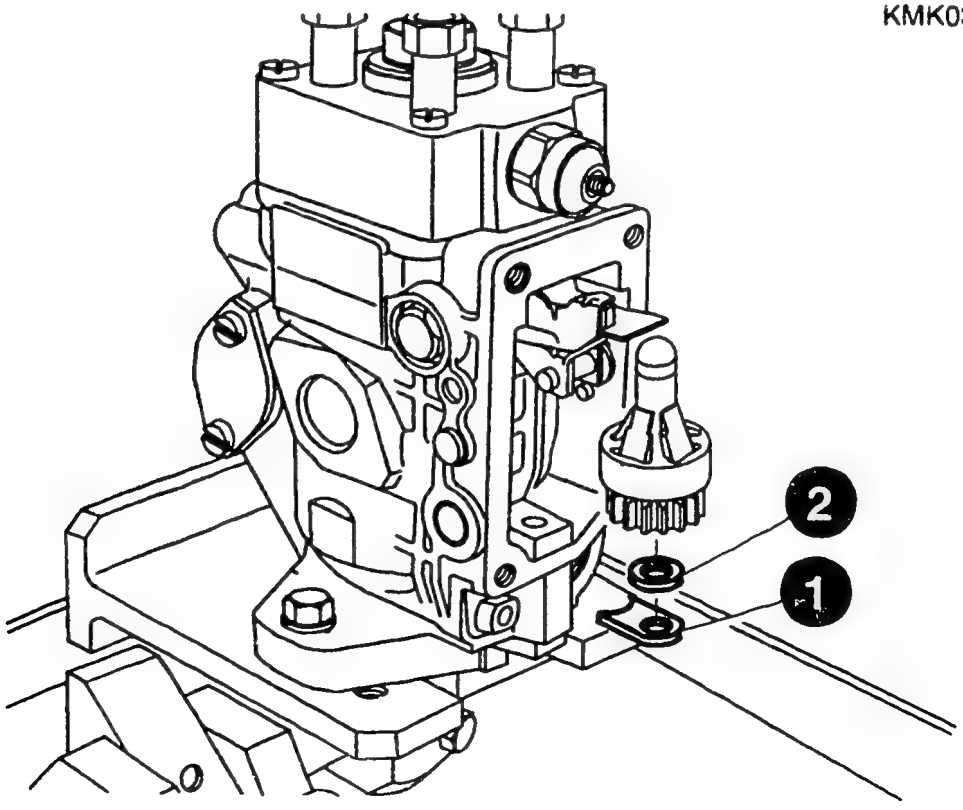
1 = Shim plate
2 = Supporting plate

Use grease to bond shim plate and supporting plate into housing.
Assemble flyweight assembly comprising: Flyweights, spacer and sliding sleeve with plug.

NOTE
All 4 flyweights must be replaced together (parts set).
Insert complete flyweight assembly in housing.

Continue: L06/1 Fig.: L05/2

KMK03441



## MEASURING POSITION OF GOVERNOR SHAFT

* Distributor-type fuel-injection pump with no load-dependent start of delivery (no data in test-specification sheet):

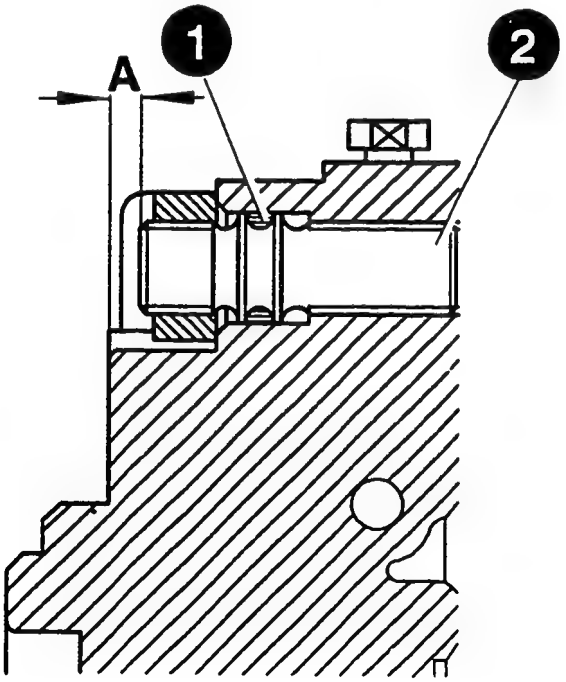
Continue on Coordinate L07/1

1 = O-ring
2 = Governor shaft

Screw governor shaft with O-ring into housing until dimension A = 1.5...2.0 mm is obtained measured from flange surface to end face of governor shaft.

Continue: L08/1 Fig.: L06/2

KMK03442



## MEASURING POSITION OF GOVERNOR SHAFT

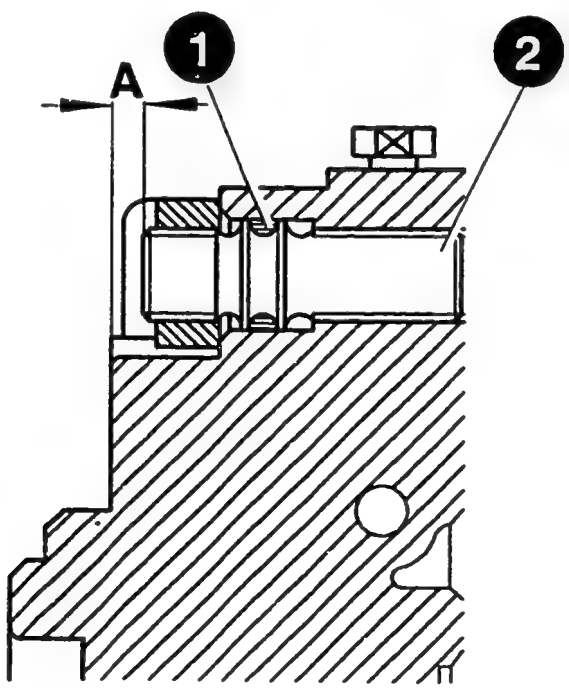
* Distributor-type fuel-injection pump with load-dependent start of delivery (data in test-specification sheet)

1 = O-ring
2 = Governor shaft

Screw governor shaft with O-ring into housing until A = approx. 3.0 mm measured from flange surface to end face of governor shaft (precise setting is made when testing distributor-type fuel-injection pump).

Continue: L08/1 Fig.: L07/2

KMK03442



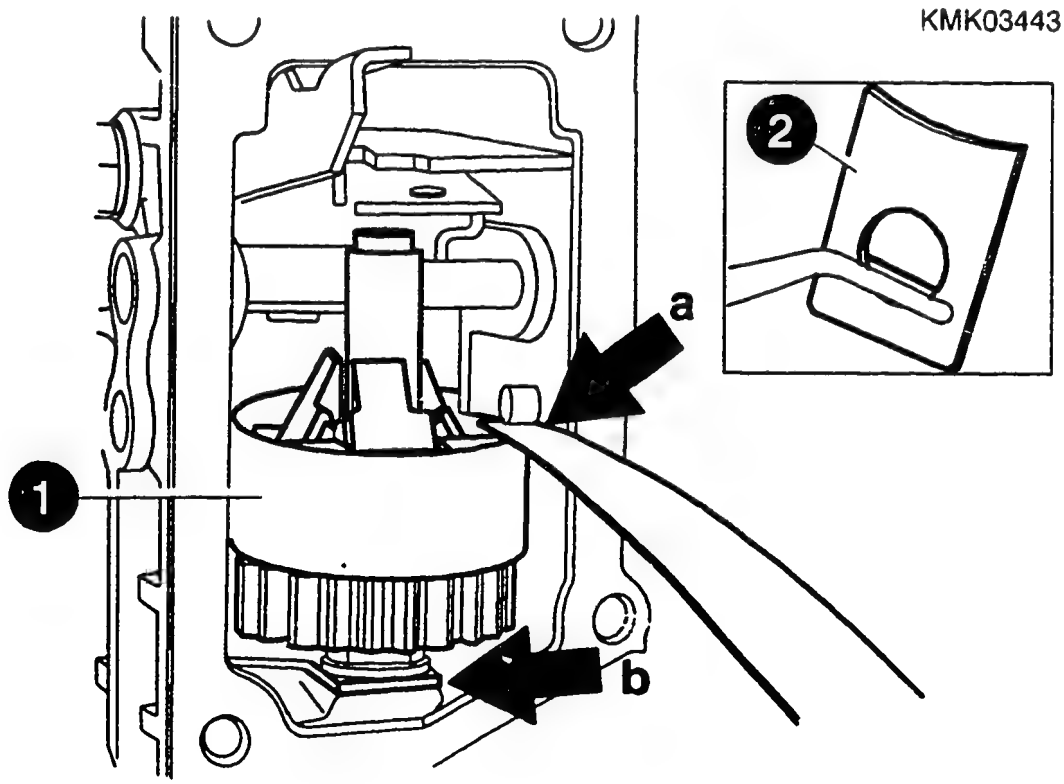
## ADJUSTING AXIAL CLEARANCE (WITH AND WITHOUT RECESS AT STOP PIN)

1 = Governor assembly
2 = Shim plate

Measure axial clearance of governor assembly with feeler gauge (arrow a).
Adjustment dimension 0.25 ... 0.45 mm
Check dimension max. 0.65 mm

Before checking axial clearance, always crank flyweight assembly. This may increase the axial clearance. The check dimension is then max. 0.65 mm.

Continue: L09/1 Fig.: L08/2



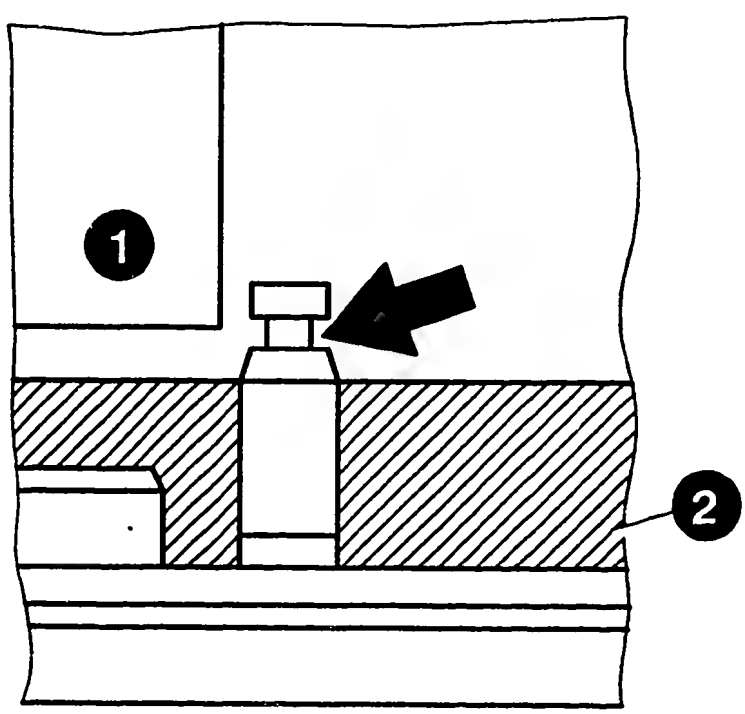
## ADJUSTING AXIAL CLEARANCE

1 = Flyweight assembly
2 = Injection-pump housing

When renewing injection-pump housing or governor assembly, only governor assemblies with bronze bushing may be installed in housing where the stop pin does not have a recess (arrow).

Continue: L10/1 Fig.: L09/2

KMK03444



## ADJUSTING AXIAL CLEARANCE

NOTE
When testing field pumps (not repaired fuel-injection pumps) the governor assembly satisfies its function if it does not stick on the stop pin on being cranked. A clearance of min. 0.1 mm is permitted.
If the axial clearance is greater than 0.65 mm, this likewise has no effect on the function of the pump and is not classed as being a fault.
NOTE:
Axial clearance > 1.0 mm cam roller ring tilted in direction of distributor head.

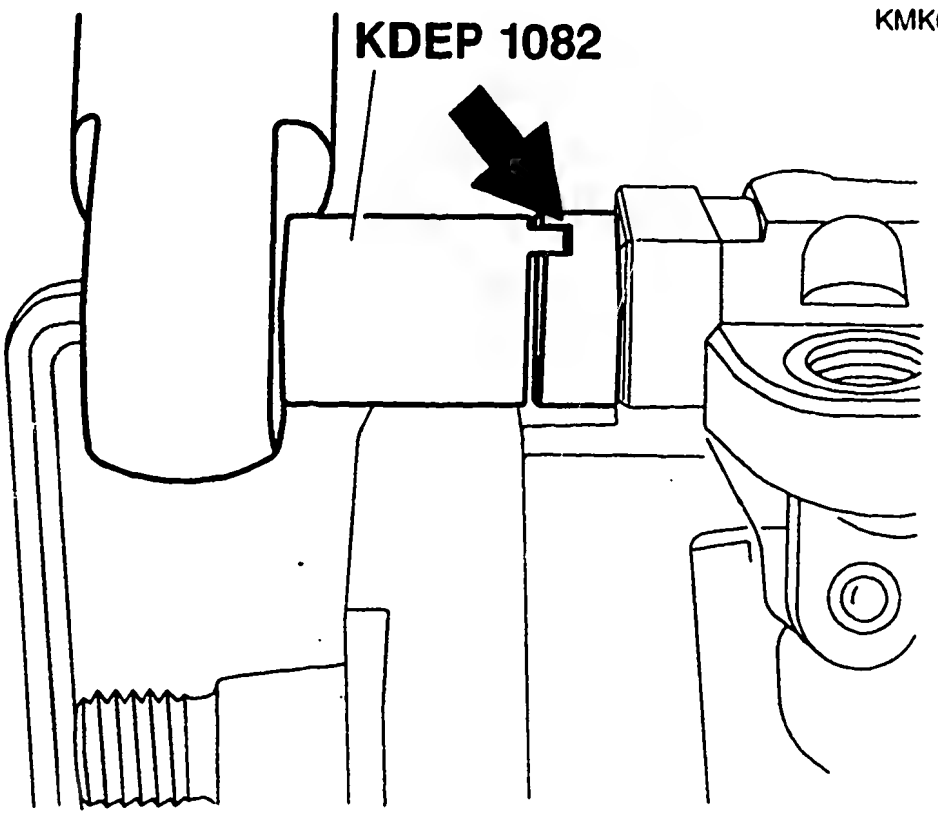
Continue: L11/1

## ADJUSTING AXIAL CLEARANCE

Position distributor-type fuel-injection pump such that it is horizontal.
Lock governor shaft with slotted nut/hexagon nut.
Tightening torque 22 ... 30 Nm
Use adjustment tool KDEP 1082.

NOTE:
As regards all clockwise-rotation fuel-injection pumps with pilot diameter 50 mm, the thread of the governor shaft and pump housing was switched from left-hand thread to right-hand thread as of FD (date of manufacture) 151.

Continue: L12/1 Fig.: L11/2



## ADJUSTING AXIAL CLEARANCE

Slotted nuts with left-hand thread may be marked as follows:

* Peripheral groove

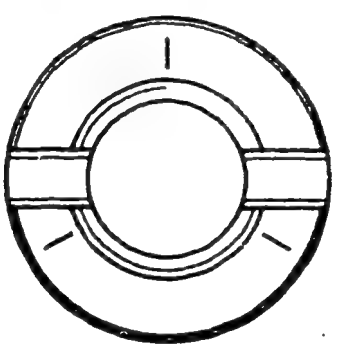
* "L" on end faces of slotted nut, picture a
  Left-hand thread, yellow surface

* Notches on end face of slotted nut, picture b

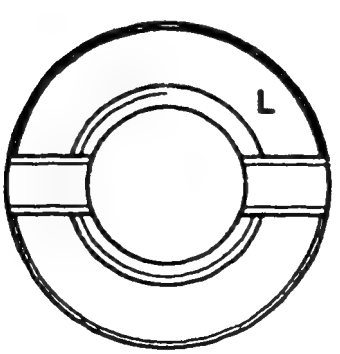
NOTE
Right-hand thread, white surface

Continue: L13/1 Fig.: L12/2

KMK03146



a




b

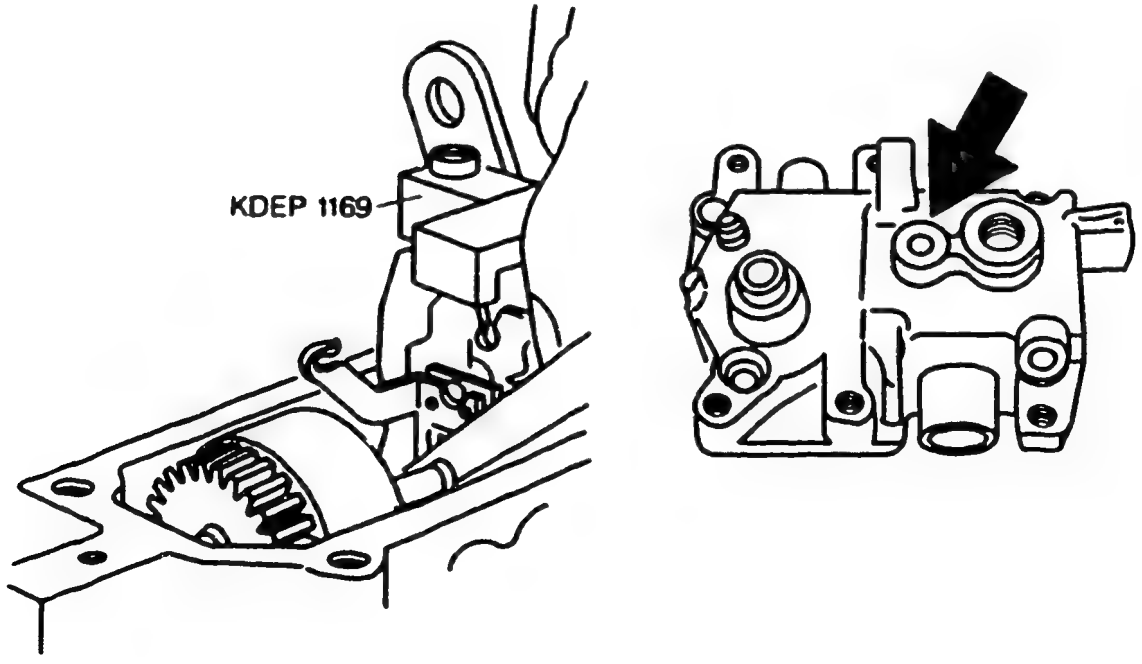
## CALIBRATING SLIDING-SLEEVE INITIAL TRAVEL "MS" DIMENSION

*Select adjustment in line with following characteristic features:

* Fulcrum lever stop in distributor-pump housing — L14/1

* Fulcrum lever stop in housing (arrow)
  Can be seen from outside by way of recess in housing cover — L16/1

Continue: L14/1 Fig.: L13/2




KMK02346

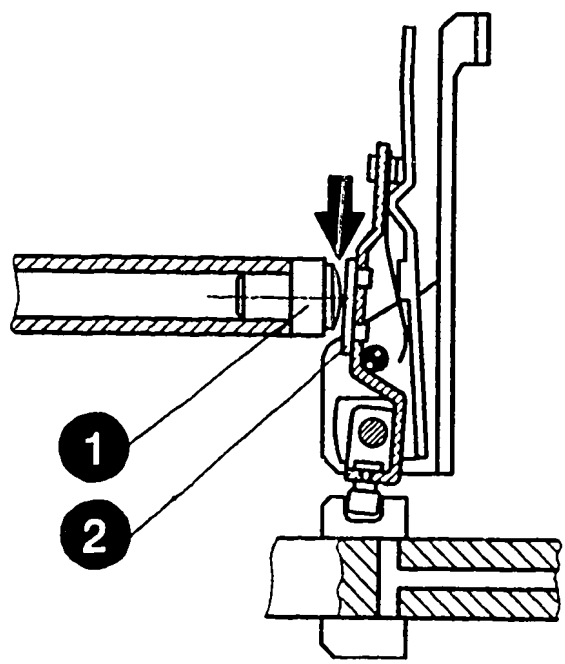
DETERMINING DIMENSION "MS" (INITIAL SLIDING-SLEEVE TRAVEL)
 * Stop in pump housing

1 = Plug
2 = Starting lever

When setting dimension "MS", particular attention is to be paid to the correct combination of starting lever and plug.
The crucial characteristic is the stop pin (arrow) in the starting lever.

If these combinations are not given consideration, there will be increased wear at the contact point of plug and starting lever.

Continue: L15/1  Fig.: L14/2



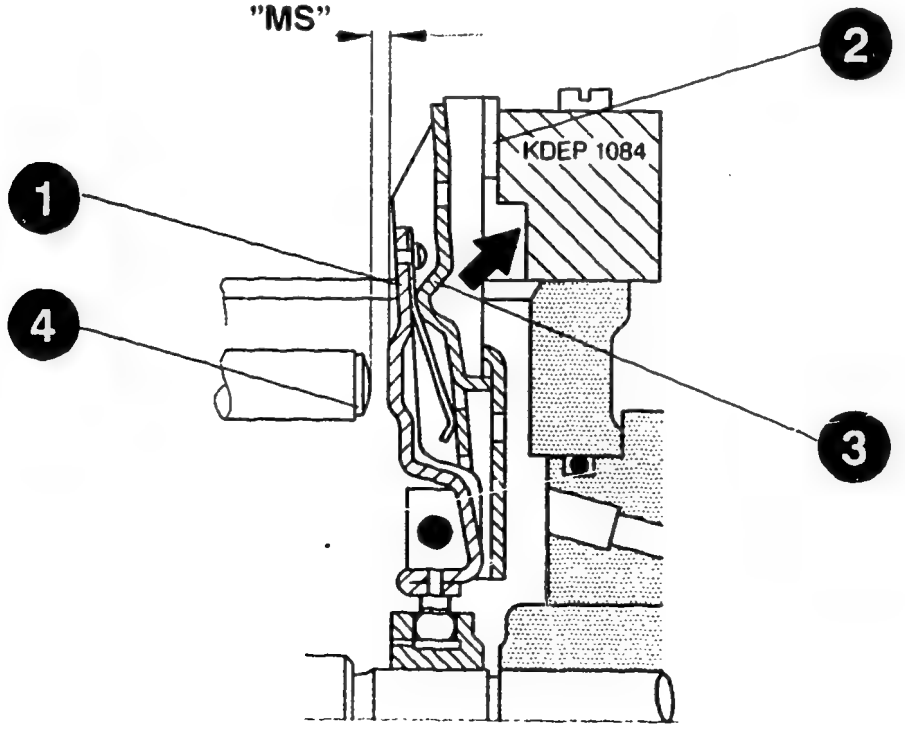

KMK02357

DETERMINING DIMENSION "MS" (INITIAL SLIDING-SLEEVE TRAVEL)

1 = Starting lever
2 = Correction lever
3 = Tensioning lever
4 = Plug

The dimension "MS" is the dimension between plug and starting lever in contact with the tensioning lever.
 * Stop in pump housing
Attach spacer KDEP 1084 to pump housing. Pay attention to recess (arrow).

Continue: L17/1 Fig.: L15/2

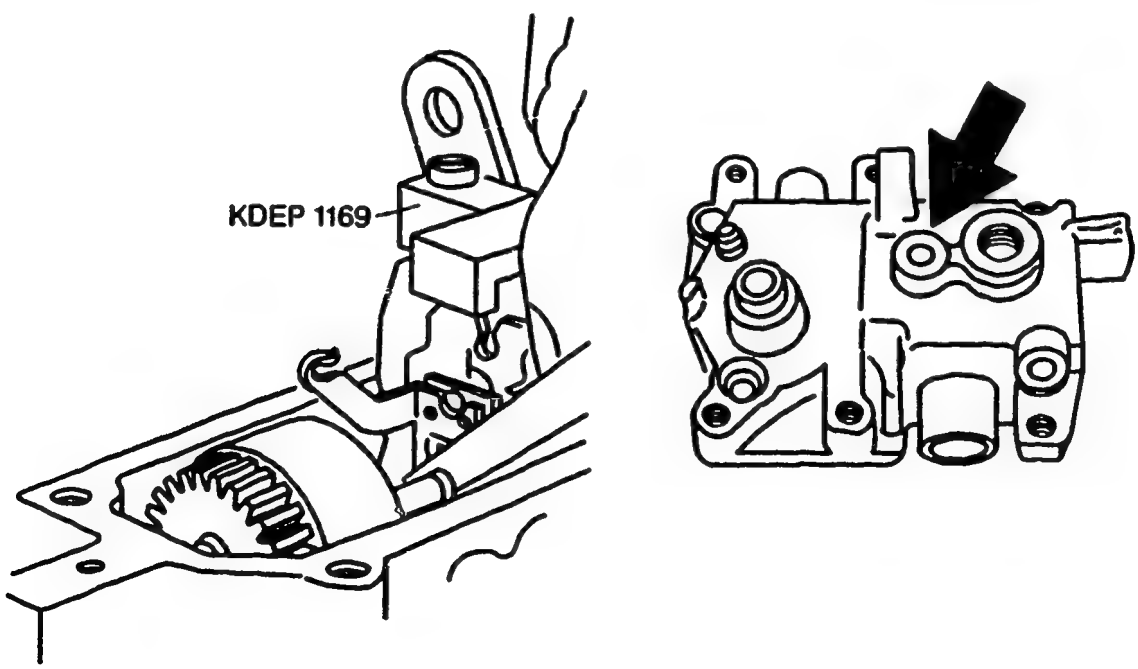



KMK02348

## DETERMINING DIMENSION "MS" (INITIAL SLIDING-SLEEVE TRAVEL)

* Stop in housing cover
Can be seen from recess (arrow) in housing cover.
Attach stop bracket KDEP 1169 to pump housing.

Continue: L17/1 Fig.: L16/2




KMK02346

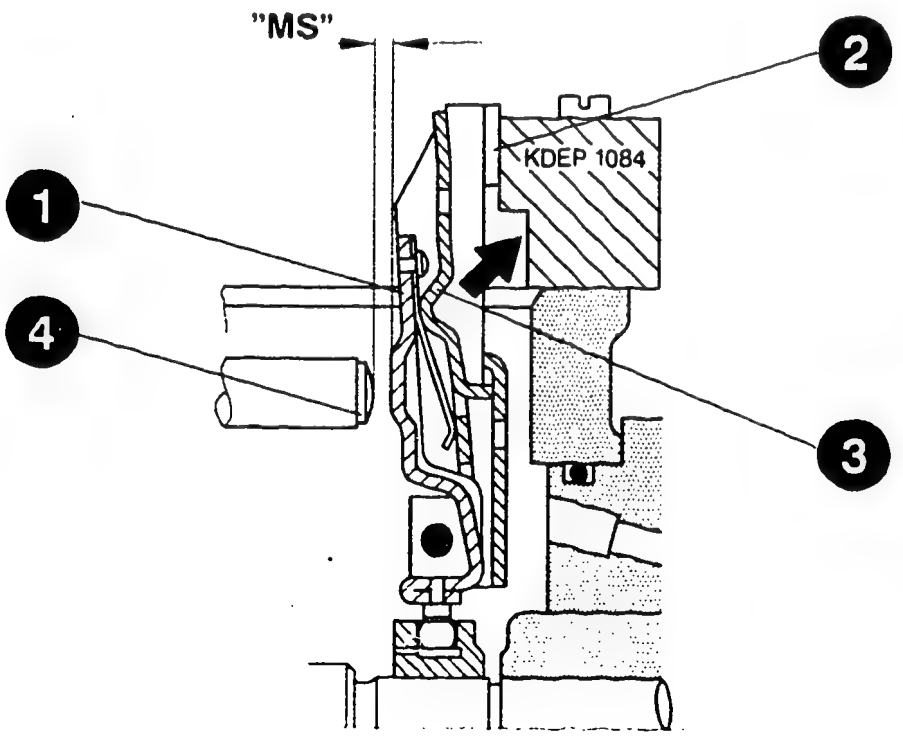
## DETERMINING DIMENSION "MS" (INITIAL SLIDING-SLEEVE TRAVEL)

2 = Correction lever
3 = Tensioning lever

* Procedure with KDEP 1084:
Correction lever in contact with spacer.
Press tensioning lever against stop pin.

* Procedure with KDEP 1169:
Correction lever in contact with stop bracket.
Press tensioning lever against lug of stop bracket.
Measure dimension "MS" with feeler gauge and compare to desired dimension in test-specification sheet.

Continue: L18/1



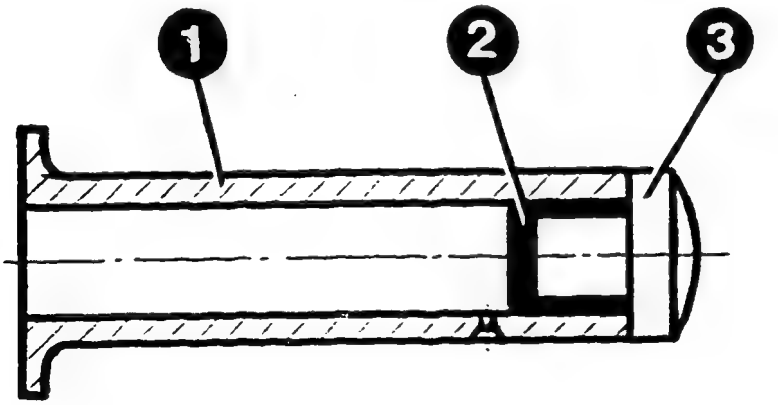

KMK02348

## DETERMINING DIMENSION "MS" (INITIAL SLIDING-SLEEVE TRAVEL)

1 = Sliding sleeve
2 = Rubber sealing cap
3 = Plug

Provide compensation for difference in dimension by way of appropriate plug in sliding sleeve.
To do so, the entire governor assembly with sliding sleeve must be removed again.

Continue: L19/1 Fig.: L18/2




KMK 02351

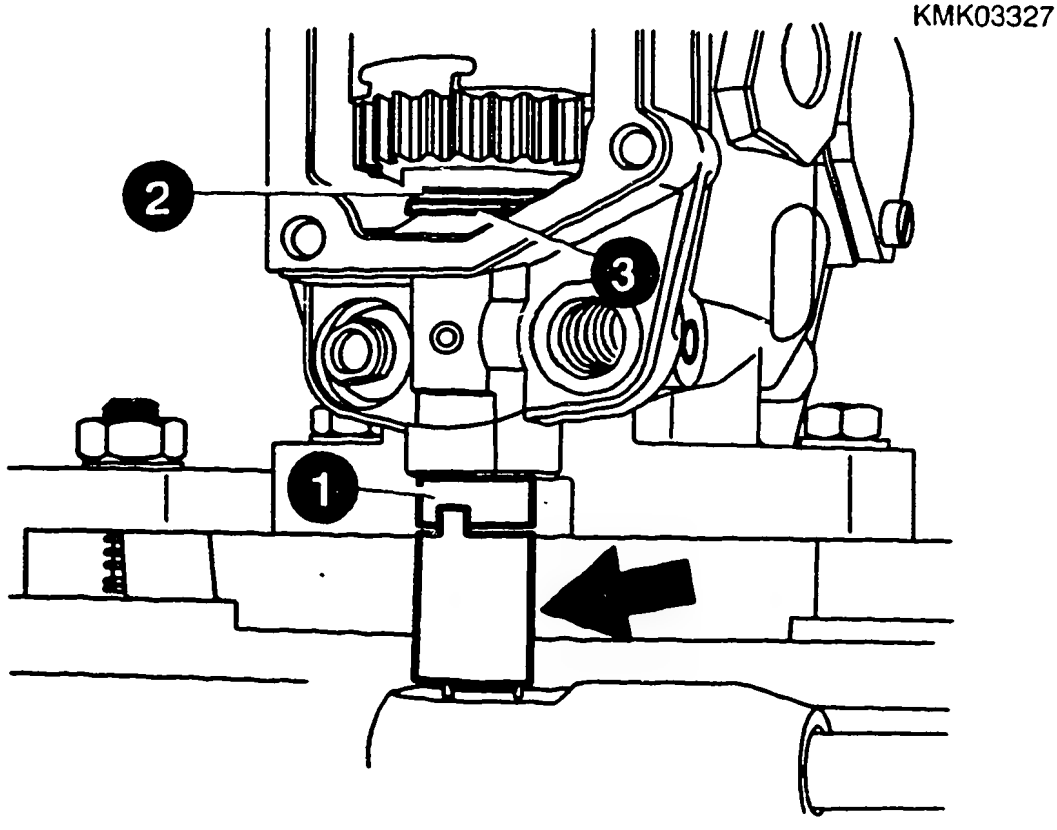
DETERMINING DIMENSION "MS" (INITIAL SLIDING-SLEEVE TRAVEL)

1 = Slotted nut
2 = Supporting plate
3 = Shim plate

In the case of slotted nuts with identification groove on periphery governor shaft and slotted nut feature left-hand thread.
Position distributor-type fuel-injection pump such that it is perpendicular. Loosen slotted nut with adjustment tool KDEP 1082 (arrow).
Pay attention to supporting plate and shim plate.

Continue: L20/1 Fig.: L19/2

KMK03327

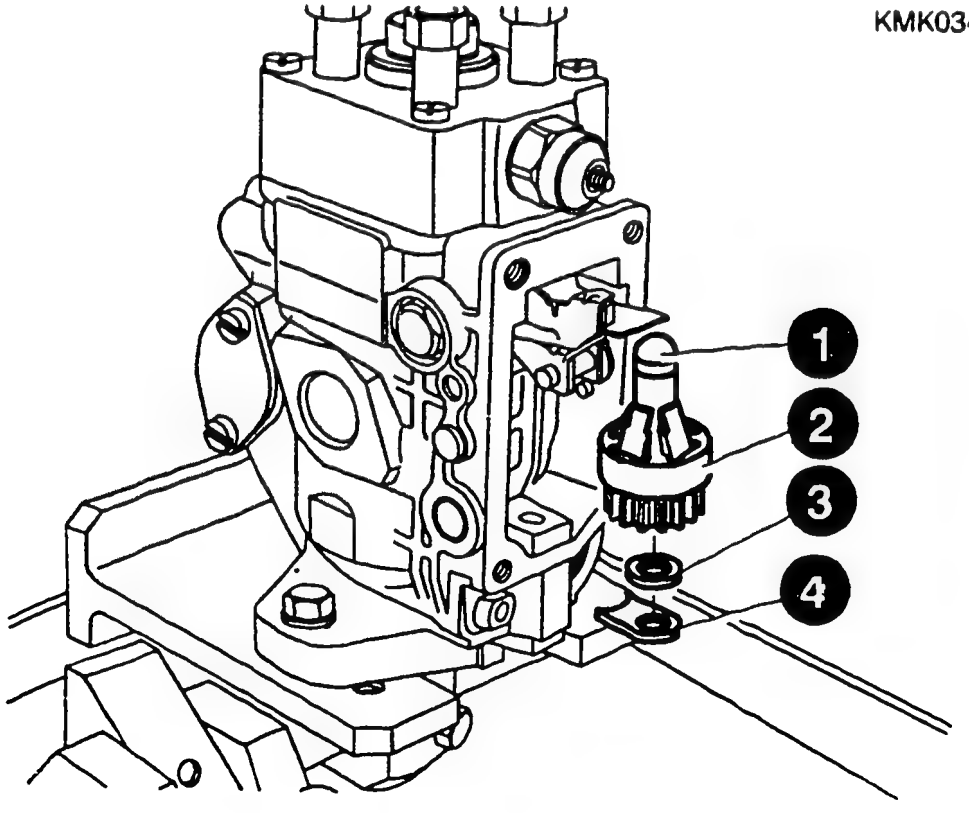


## DETERMINING DIMENSION "MS" (INITIAL SLIDING-SLEEVE TRAVEL)

1 = Sliding sleeve
2 = Governor assembly
3 = Supporting plate
4 = Shim plate

Lift out governor assembly complete with sliding sleeve.
Remove supporting plate and shim plate.
When disassembling governor assembly, pay particular attention to spacer beneath sliding sleeve (take care not to lose).

Continue: L21/1 Fig.: L20/2

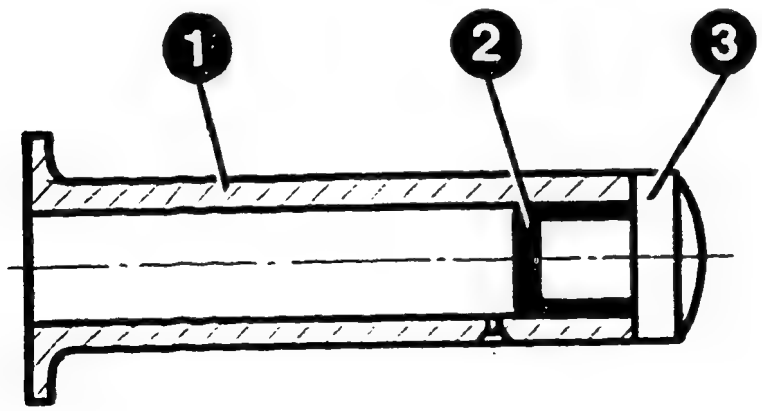


## DETERMINING DIMENSION "MS" (INITIAL SLIDING-SLEEVE TRAVEL)

1 = Sliding sleeve
2 = Rubber sealing cap
3 = Plug

As of FD (date of manufacture) 927 the plug is secured in position in the sliding sleeve with a rubber sealing cap instead of with a tab washer.
The sliding sleeve features a restriction bore with countersink. (see picture).
Sealing cap may be installed instead of tab washer. Replacement of sliding sleeve is not necessary even if restriction bore has no countersink.

Continue: L22/1 Fig.: L21/2



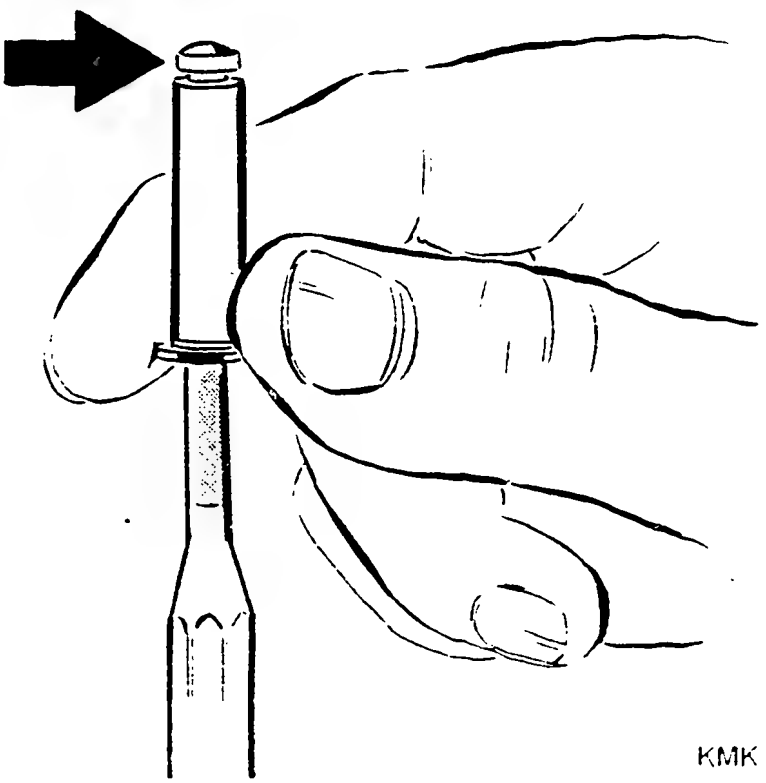

KMK 02351

## DETERMINING DIMENSION "MS" (INITIAL SLIDING-SLEEVE TRAVEL)

Press out plug (arrow) with mandrel. When pressing in appropriate plug, pay attention to tab washer or rubber sealing cap.

Re-install governor assembly and re-check dimension "MS".

Continue: L23/1 Fig.: L22/2



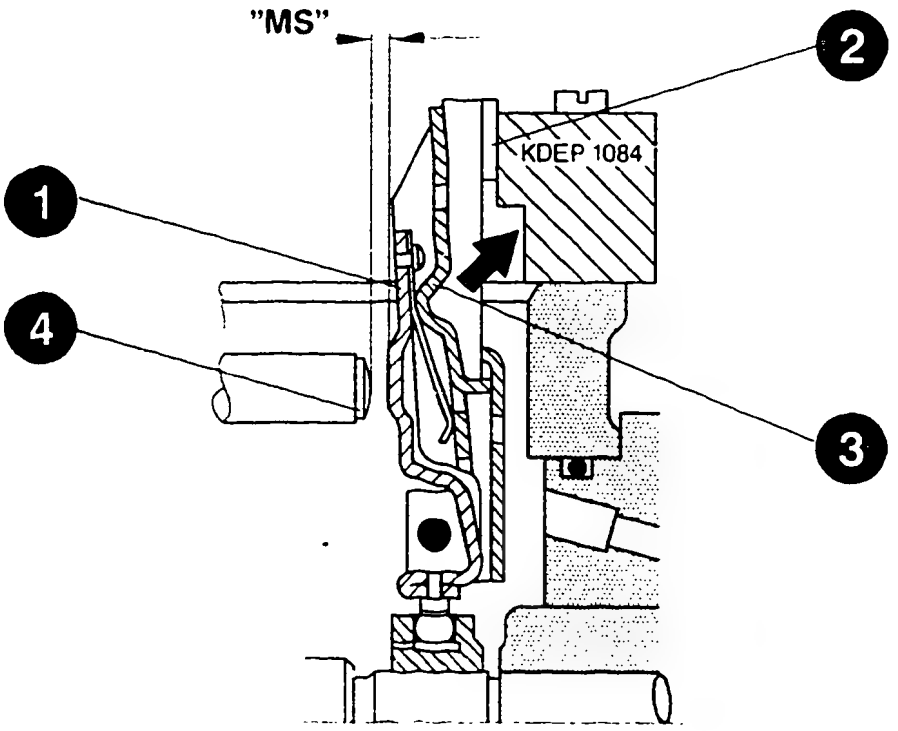
KMK 02352

## DETERMINING DIMENSION "MS" (INITIAL SLIDING-SLEEVE TRAVEL)

1 = Starting lever
2 = Correction lever
3 = Tensioning lever
4 = Plug

Use grease to bond shim plate and supporting plate into housing.
Assemble governor assembly comprising flyweights, spacer and sliding sleeve with plug.
Attach spacer KDEP 1084 or stop bracket KDEP 1169 to pump housing with fillister-head screws.

Continue: L24/1 Fig.: L23/2




KMK02348

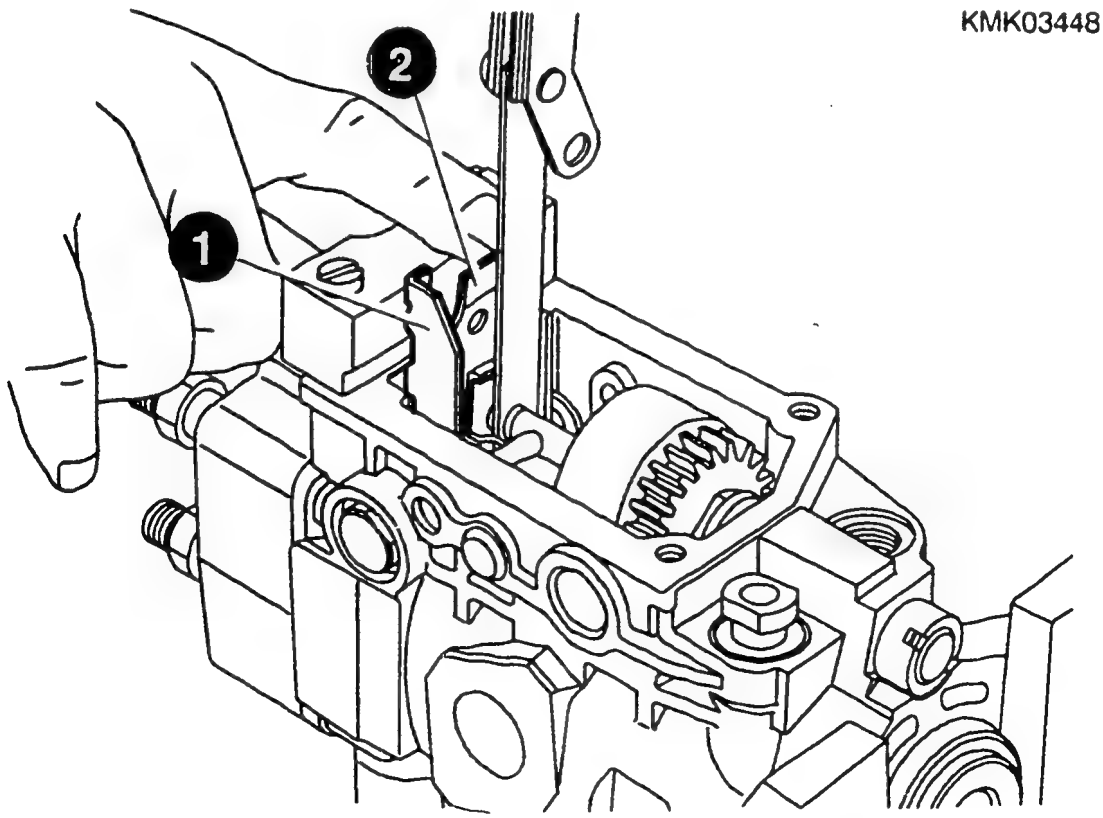
DETERMINING DIMENSION "MS" (INITIAL SLIDING-SLEEVE TRAVEL)

1 = Correction lever
2 = Tensioning lever

Correction lever in contact with spacer.
Press tensioning lever against stop pin.
Use feeler gauge to determine dimension "MS" and compare data in test-specification sheet.

Remove spacer KDEP 1084 if dimension "MS" is correct.

Continue: L25/1



INSTALLING GOVERNOR

Select adjustment sequence in line with following characteristics:

* Part-load governor with detachment surfaces L26/1

* Part-load governor with no detachment surfaces 127/1

* Variable-speed governor M02/1

Continue: L26/1

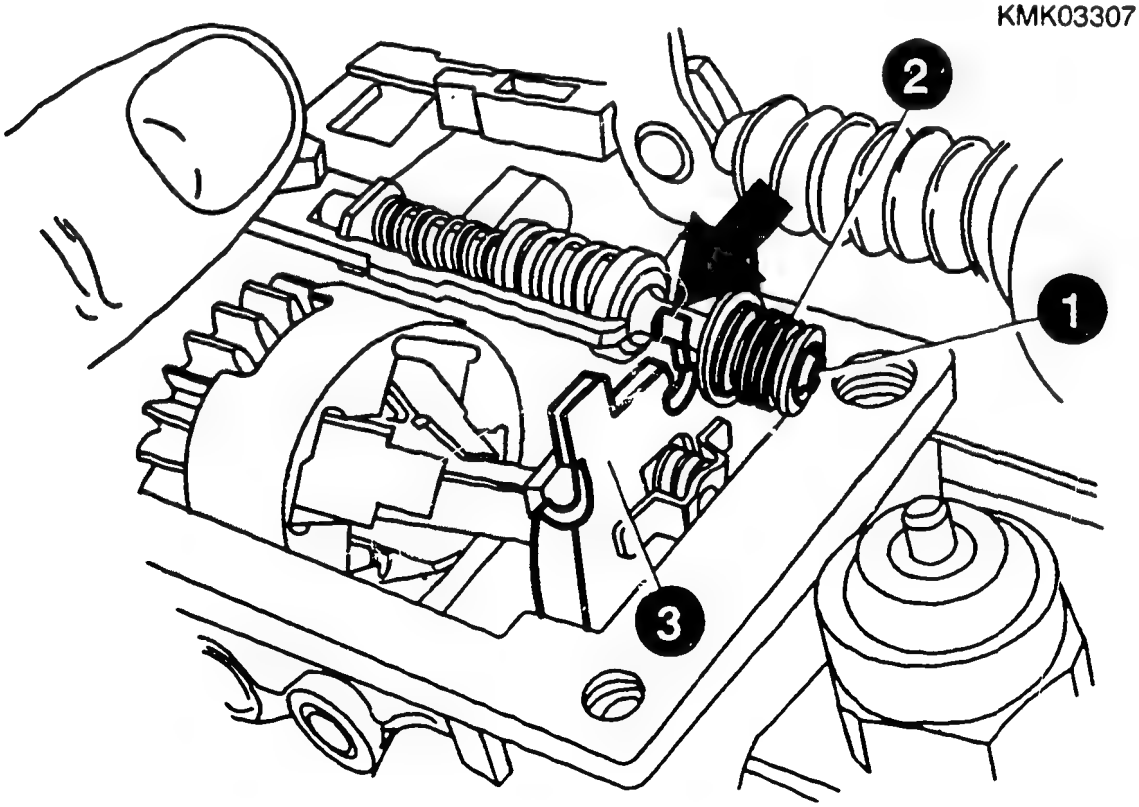
INSTALLING PART-LOAD GOVERNOR
* Version with detachment surfaces

1 = Retaining pin
2 = Intermediate spring
3 = Tensioning lever

Engage milled surfaces (arrow) of part-load governor in part-load governor such that retaining pin and intermediate spring are behind tensioning lever.

Continue: L28/1 Fig.: L26/2

KMK03307

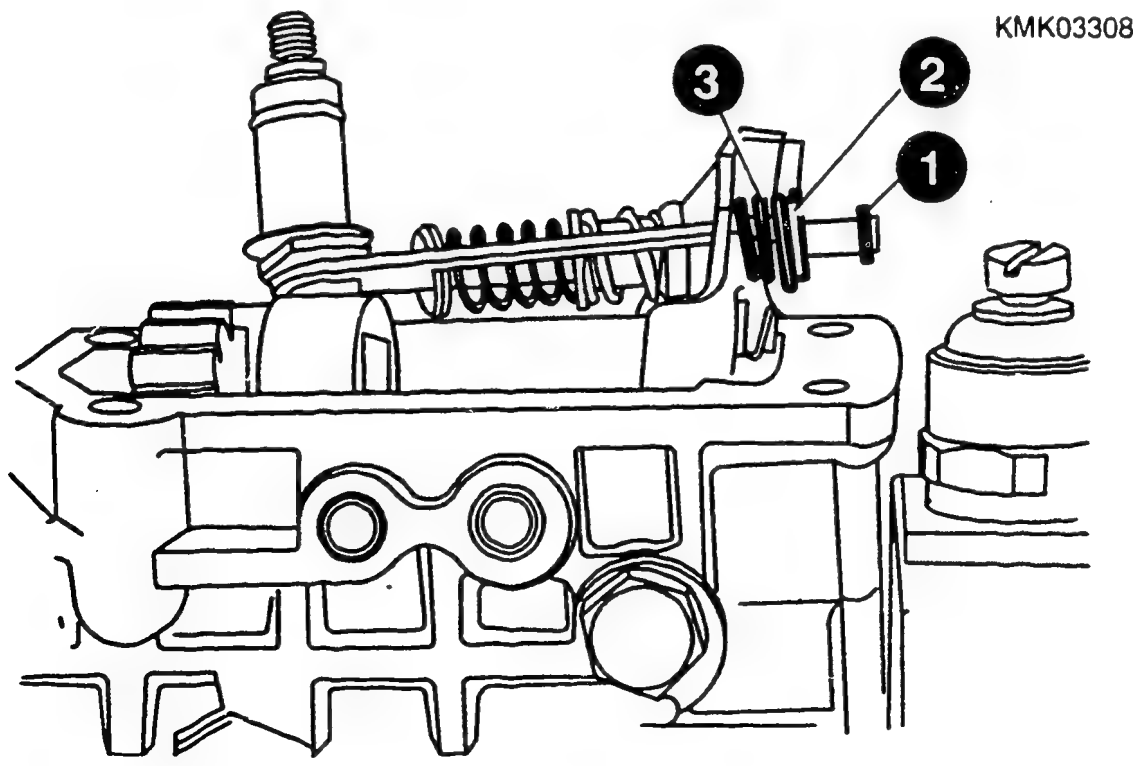


INSTALLING PART-LOAD GOVERNOR
 * Version with no detachment surfaces

1 = Retaining ring
2 = Retaining pin
3 = Intermediate spring

Insert part-load governor with setting shaft in fulcrum lever assembly.
Push intermediate spring and retaining pin onto guide pin (part-load governor).
Install retaining ring on guide pin.

Continue: L28/1  Fig.: L27/2



INSTALLING PART-LOAD GOVERNOR IN HOUSING

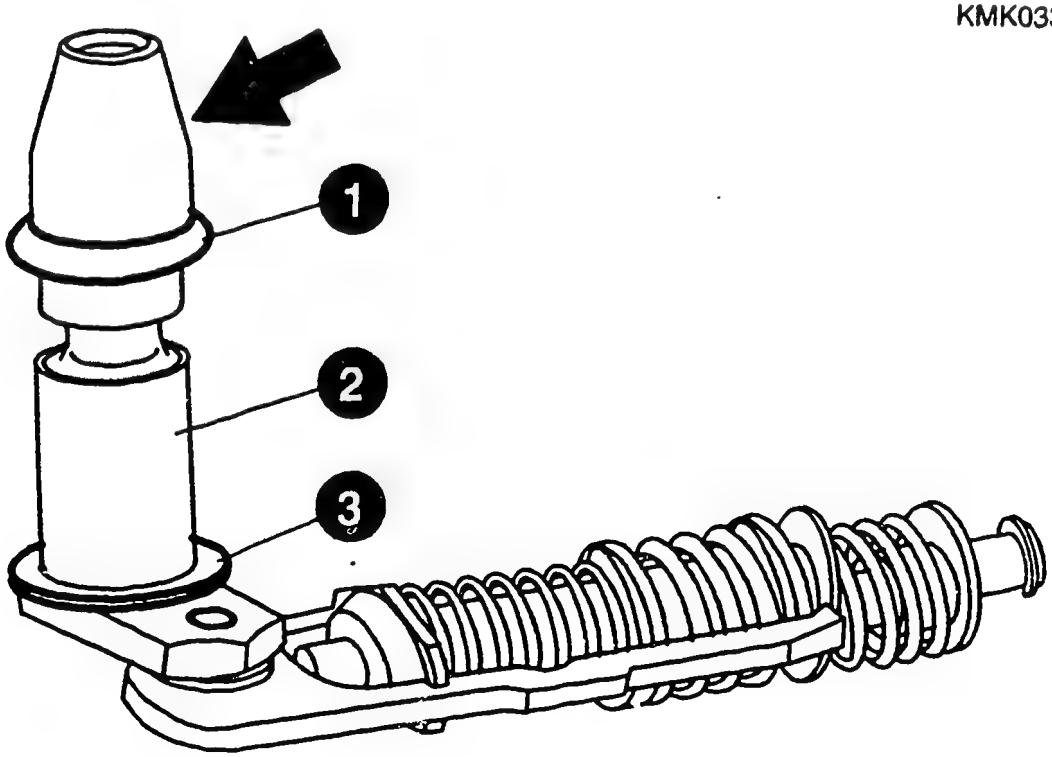
1 = O-ring
2 = Setting shaft
3 = Shim

Fit shim.
Install assembly sleeve KDEP 2937 on setting shaft to protect O-ring.

Fit O-ring.

Continue: M01/1 Fig.: L28/2

KMK03309



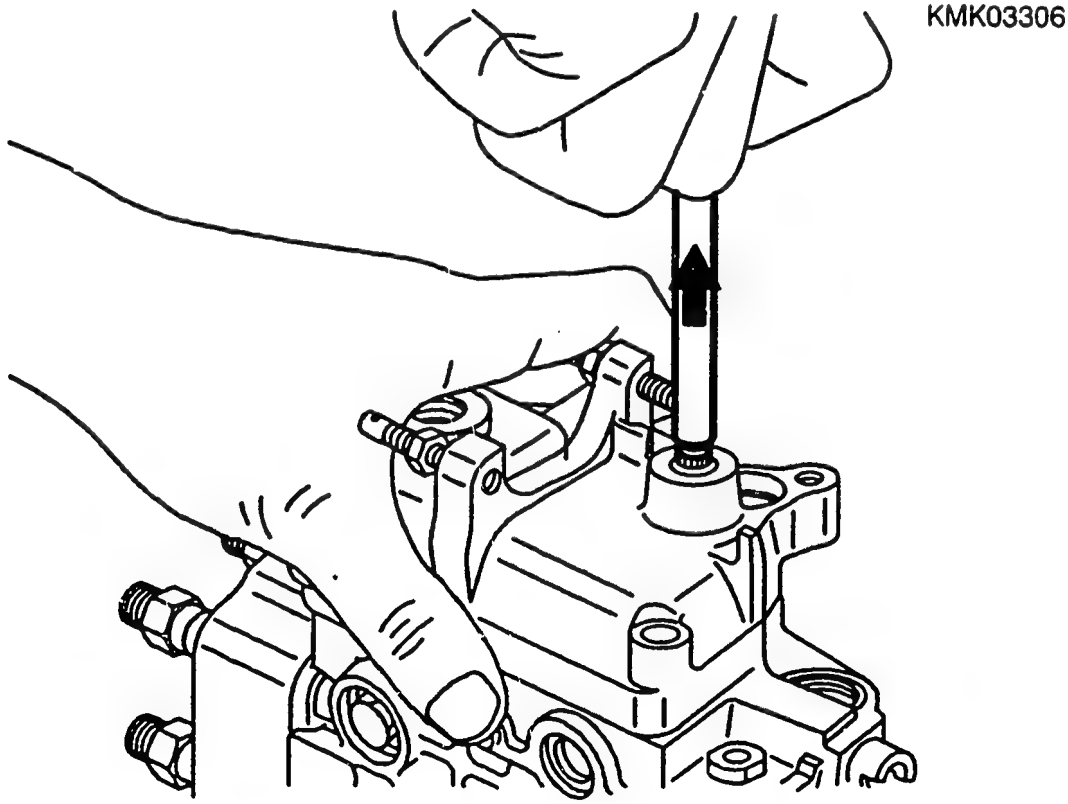
## INSTALLING PART-LOAD GOVERNOR IN HOUSING

Insert new seal ring in housing cover.
Position housing cover on pump housing.
Pull part-load governor through housing cover with assembly wrench KDEP 1096 (arrow).
Fit new threaded pin (full-load stop screw).

Attach housing cover.

Continue: M05/1 Fig.: M01/2

KMK03306



## INSTALLING VARIABLE-SPEED GOVERNOR

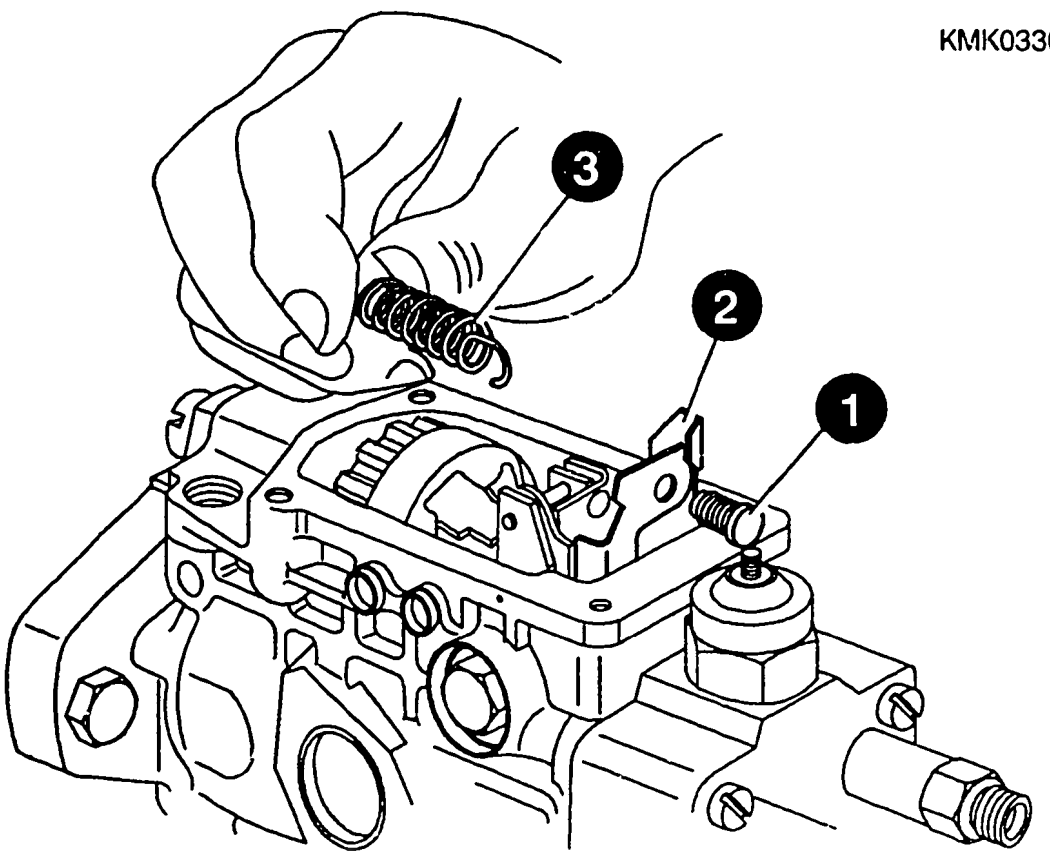
1 = Retaining pin with compression spring
2 = Tensioning lever
3 = Governor spring

Insert retaining pin with compression springs through hole in tensioning lever and engage extension spring.

Note:
Retaining pin with compression springs is to be viewed as a unit and may only be replaced complete (parts set).

Continue: M03/1 Fig.: M02/2

KMK03304



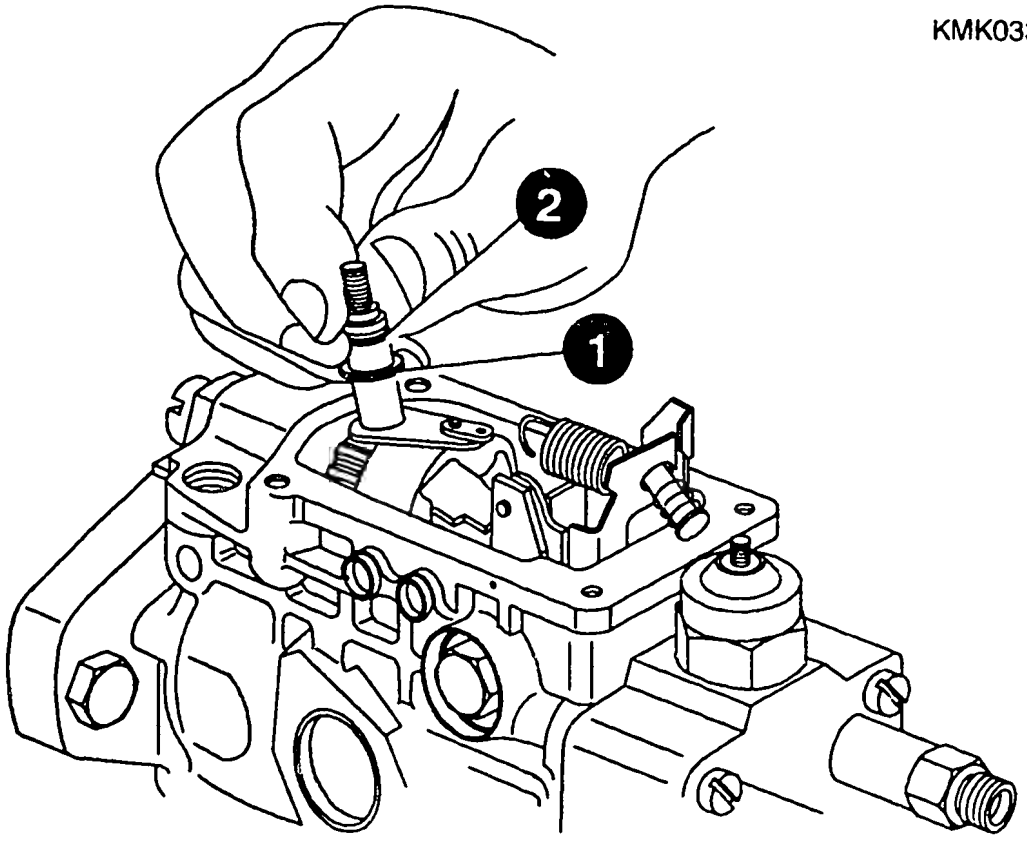
## INSTALLING VARIABLE-SPEED GOVERNOR

1 = Shim
2 = O-ring

Position shim and O-ring on control lever shaft.
Attach assembly sleeve KDEP 2937 to setting shaft to protect O-ring.
Engage governor spring at joint of setting shaft.
Make sure that eye opening faces downwards.
Grease O-ring of setting shaft before installing setting shaft in governor cover.

Continue: M04/1 Fig.: M03/2

KMK03305

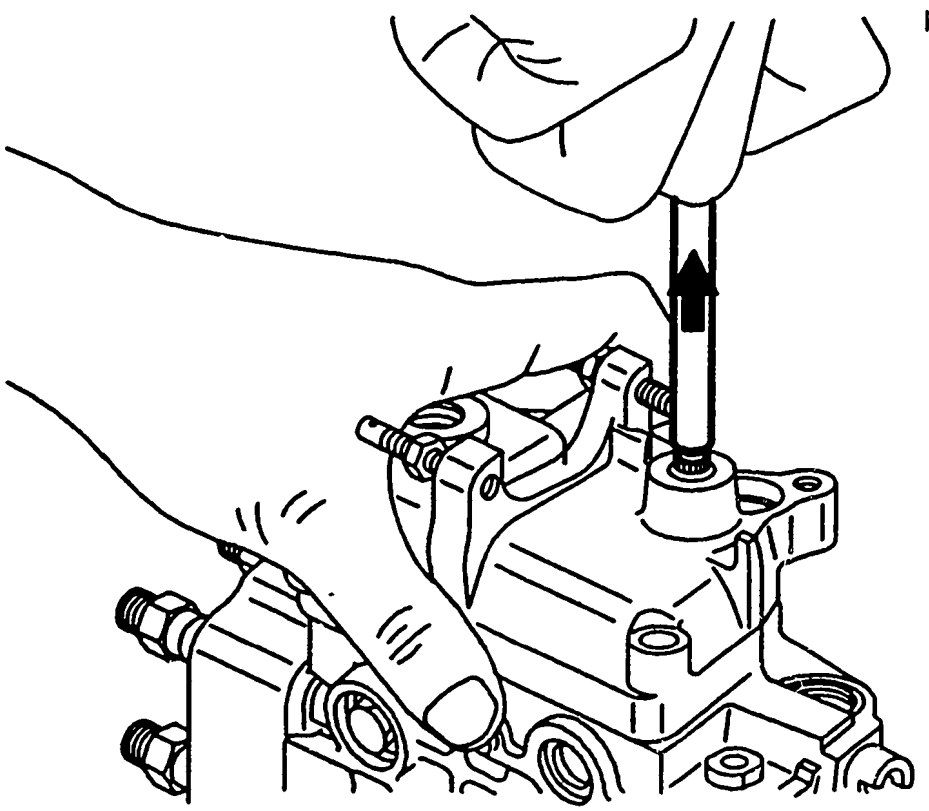


## INSTALLING VARIABLE-SPEED GOVERNOR

Fit new seal ring in housing cover.
Attach housing cover to pump housing.
Pull governor through housing cover with assembly wrench KDEP 1096 (arrow).
Attach housing cover.
Fit new threaded pin (full-load stop screw).

Continue: M05/1 Fig.: M04/2

KMK03306



FITTING CONTROL LEVER

Select adjustment sequence in line with following characteristics:

| | |
|---|---|
| Fitting control lever with single spring system | M06/1 |
| Fitting control lever with double spring system | M07/1 |

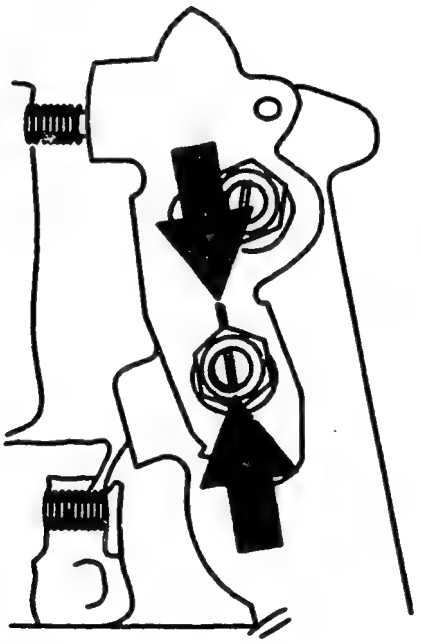
Continue: M06/1

FITTING CONTROL LEVER
 * Single spring system

1 = Cylindrical helical coiled spring
2 = Control lever
3 = Hexagon nut with spring lock washer

Fit cylindrical helical coiled spring and control lever. Install control lever on setting shaft such that marks on control lever and setting shaft coincide (arrows).
Screw in overflow restriction "OUT".

Continue: M11/1  Fig.: M06/2



KMK02289

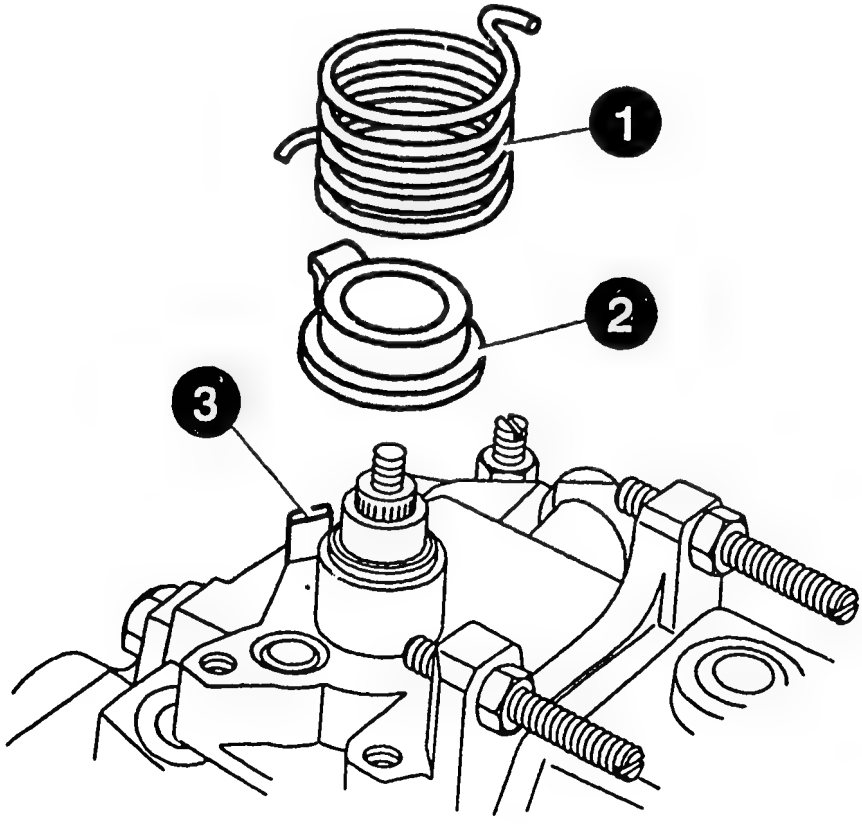
FITTING CONTROL LEVER
 * Double spring system version

1 = Cylindrical helical coiled spring
2 = Spring seat
3 = Engagement point

Position lower spring seat of first spring on housing cover.
Engage end of spring with spring seat at engagement point.

Continue: M08/1 Fig.: M07/2

KMK03449



FITTING CONTROL LEVER
 * Double spring system version

1 = Spring seat with engagement points

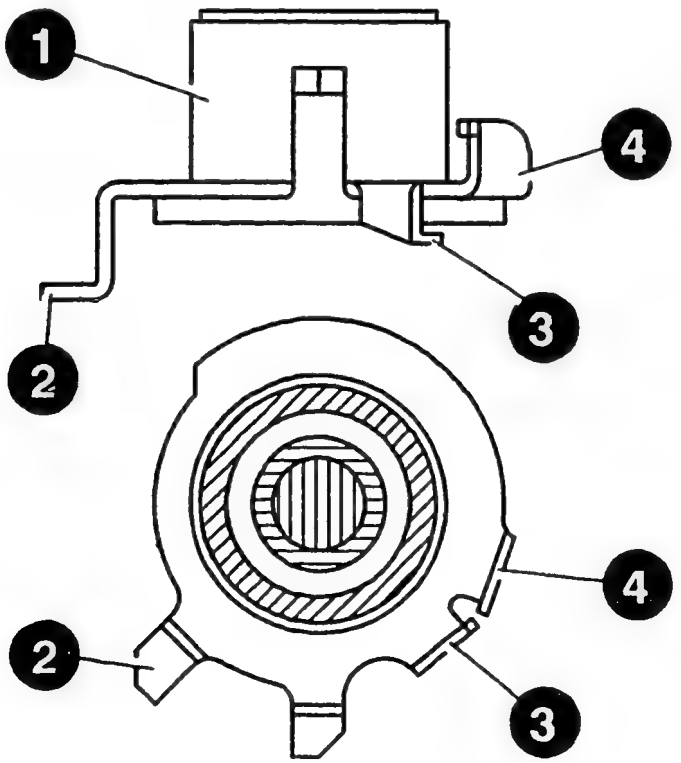
Fit spring seat with engagement points and position end of spring against tab (2).

NOTE:

When relieving tension on spring, end of spring makes contact with tab (2). This prevents uncontrolled jumping away of the spring.

Continue: M09/1  Fig.: M08/2

KMK03450



## FITTING CONTROL LEVER

* Double spring system version

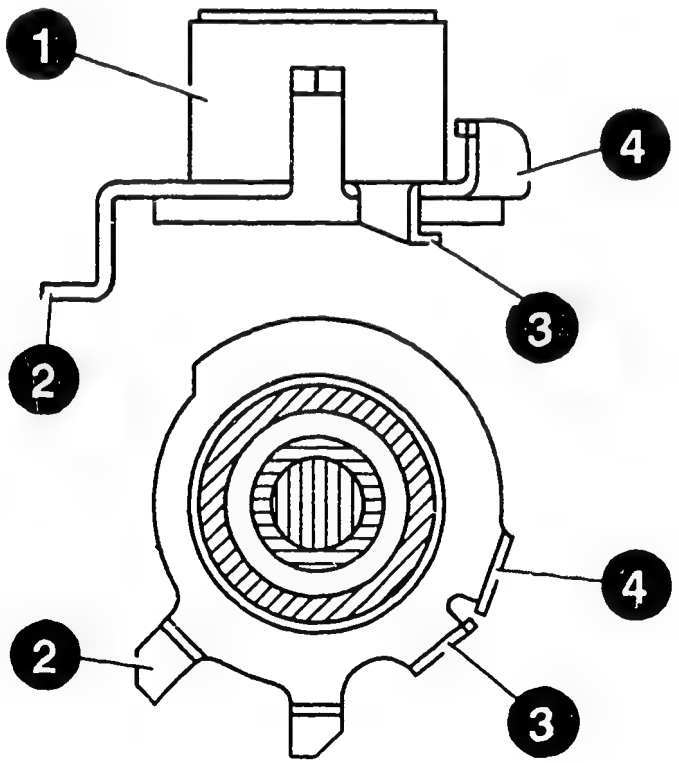
1 = Spring seat with engagement points
2 = Tab
3 = Engagement point, lower spring
4 = Engagement point, upper spring

Position upper spring at engagement point (2).

Engage lower spring at engagement point (3).

Continue: M10/1 Fig.: M09/2

KMK03450



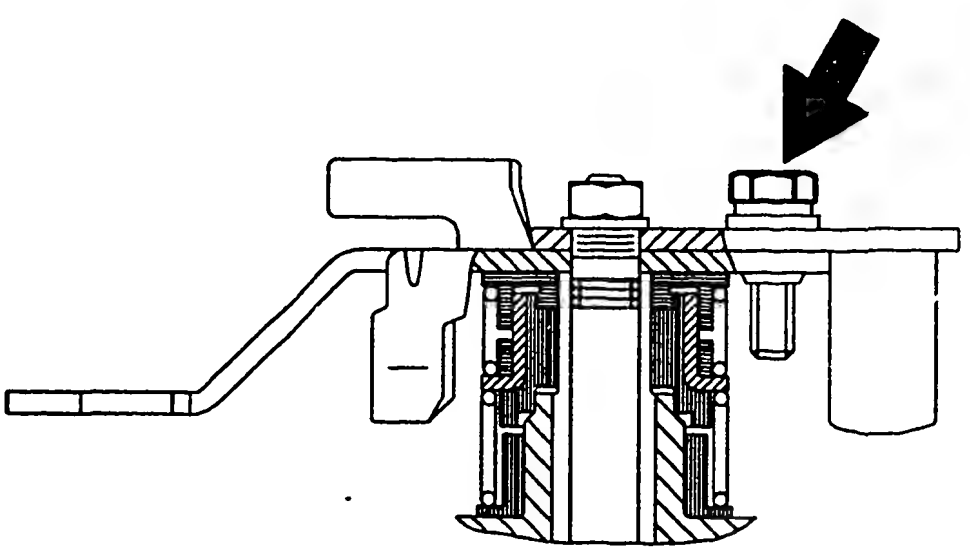
FITTING CONTROL LEVER
* Double spring system version

Fit control lever making sure that end of spring makes contact with fastening screw (arrow) of small control lever.

Engage end of spring in engagement point at speed-control lever.
Note:
Tab must not make contact with LDA housing (if provided).

Continue: M11/1 Fig.: M10/2

KMK03451



## INSTALLING TEMPERATURE-CONTROLLED IDLE INCREASE (TLA)

Assembling control device:

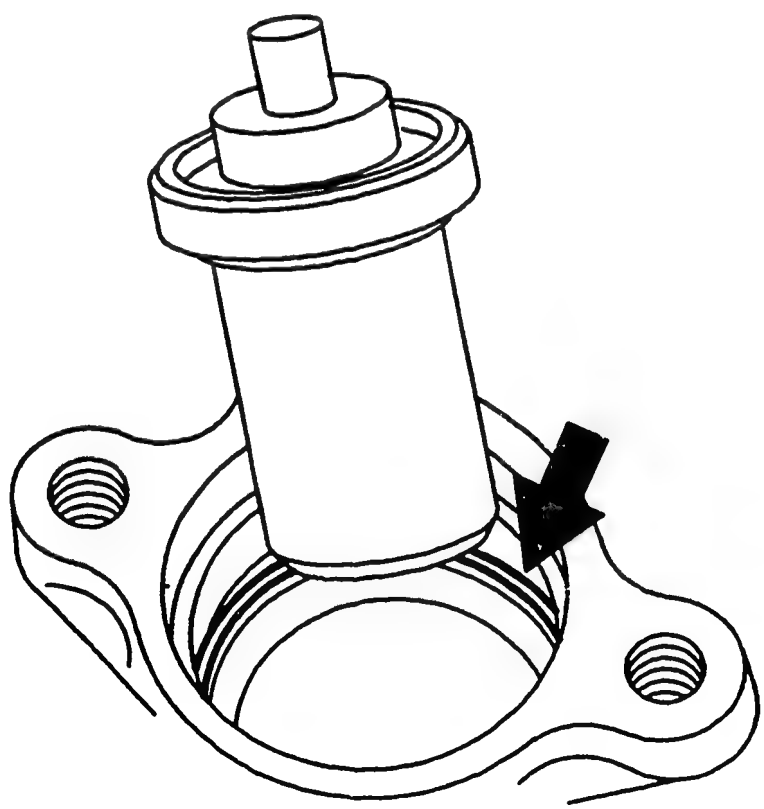
Insert O-ring (arrow) in bottom part of control device.

Pin must not be pulled out of thermostat !

Insert thermostat into control device. Screw in threaded ring and tighten with pin-type socket wrench KDEP 1110.

Continue: M12/1 Fig.: M11/2

KMK03452



## CHECKING BOTTOM PART OF CONTROL DEVICE FOR LEAKAGE

Connect one of the cooling-water fittings to compressed-air system.

Seal off second fitting with KDEP 1111.

Apply 5.0 bar to bottom part of control device and check for leakage in oil bath.

Continue: M13/1

INSTALLING CONTROL DEVICE

1 = Spring seat
2 = Inner compression spring
3 = Outer compression spring

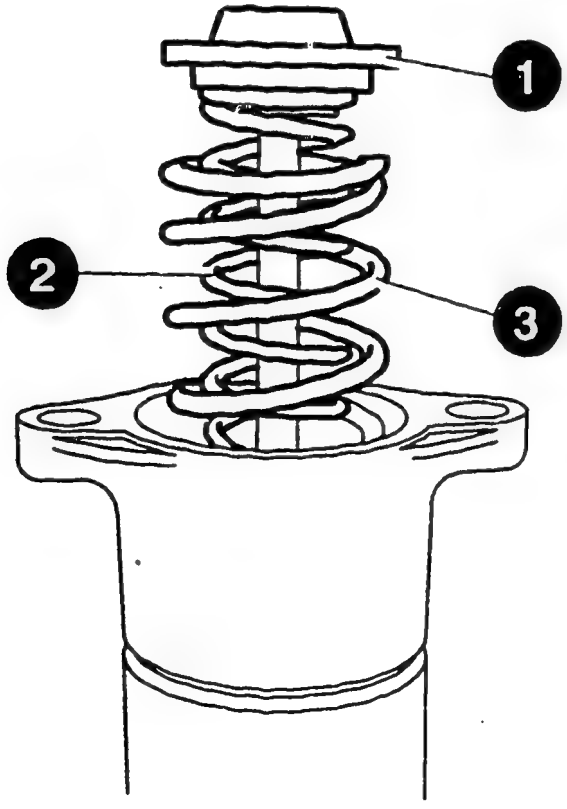
Insert top part of control device in assembly device KDEP 1109.

Insert both compression springs in control device.

Position spring seat with cable on compression springs.
In doing so, insert cable into guide hole in top part of control device.

Continue: M14/1  Fig.: M13/2

KMK03453



## INSTALLING CONTROL DEVICE

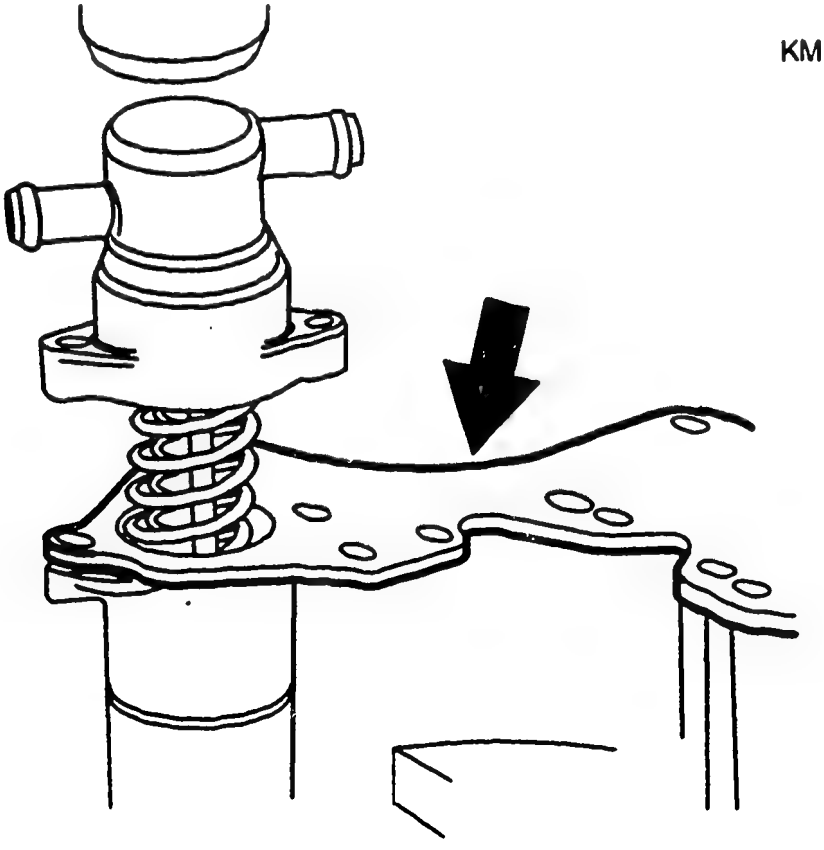
Pay attention to installation position with following operations.

Place support plate on top part of control device (arrow).

Position bottom part of control device (complete) on top part.

Continue: M16/1 Fig.: M14/2

KMK03454



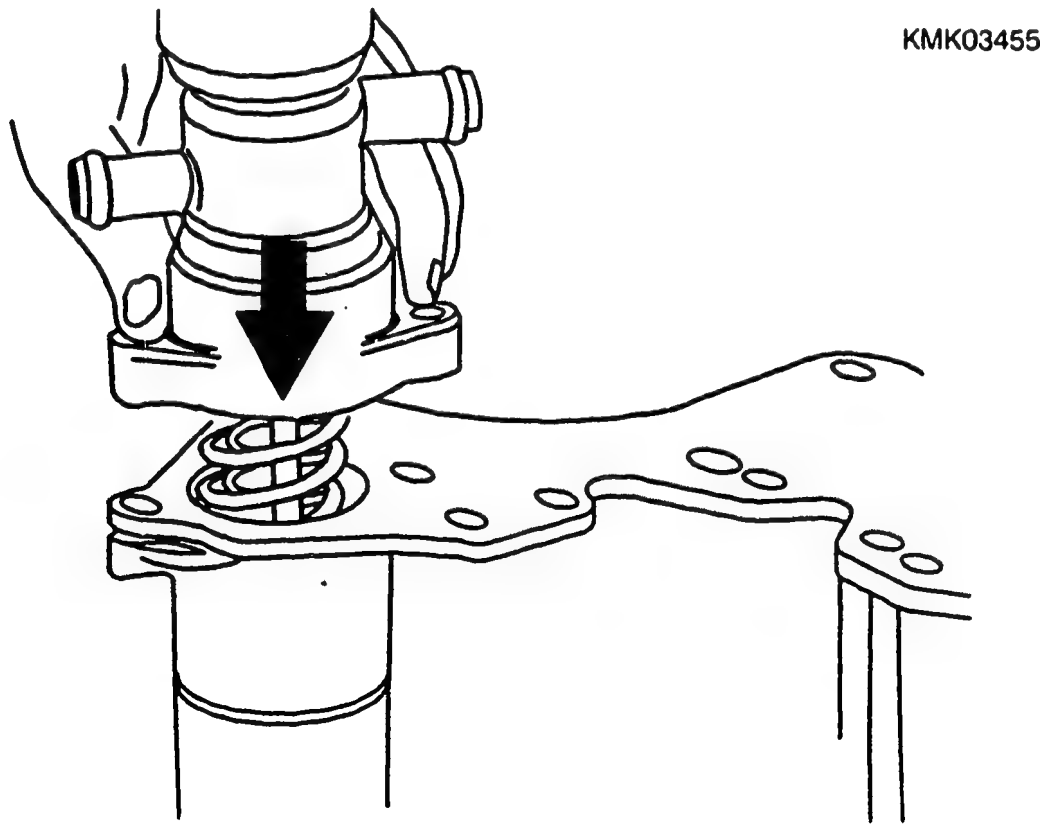
## INSTALLING CONTROL DEVICE

When performing following operation, make sure that guide sleeve of wire rope/bottom part of control device is not damaged.

Carefully press bottom part of control device onto top part using mandrel press.

Screw in and tighten fillister-head screws.

Continue: M16/1 Fig.: M15/2



INSTALLING CONTROL DEVICE

Remove complete control device from assembly device.

For checking purposes do not yet attach control device to distributor head.

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EDITORIAL NOTE



Published by:
After-Sales Service Department for
Training and
Technology (KH/VSK).
Time of going to press 10.1992.
Please direct questions and comments
concerning the contents to our
authorized representative in your
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EDITORIAL NOTE



Microfilmed in the Federal Republic of
Germany.

Microphotographié en République
Fédérale d'Allemagne.

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